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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1. Some facts about fossils. Anon. *World Oil*, Jan. 1953, **136** (1), 96.—The writer discusses the importance of fossils in oilfield discovery, development, and expansion, together with the history of the science of palæontology.

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The petroleum geologist, by the use of fossils, is also able to delineate the former distribution of land and sea. A knowledge of the distribution and association of fossil types helps the geologist determine the location of the deeps and shallows of these former seas.

The article includes several tables, maps, and diagrams.

W. S. R.

2. Oilfield fossils of the Middle Eocene. D. T. Setterington. *Petroleum, Lond.*, June 1953, **16** (6), 156–8.—The larger foraminifera have proved of great assistance in stratigraphical correlation in oil-bearing regions. Various species of the Middle Eocene are identified, together with their various locations. G. H. G.

3. Conditions of formation of Flysch sediments (Flish). Z. Obuchowicz. *Nafta* (*Krakow*), 1952, **8**, 319–25.—The geological formation known as Flish has been defined as shallow water, sedimentary rock peculiar to very changeable water level and activity, and high degree of organic life. Analysing possible causes contributing to the stratified appearance and varying grain size of sediments on such an offshore shelf, the author reviews the literature and concludes that the low frequency stratifications are due to changes in water dynamics which could only be caused by tides. M. S.

4. A review of the geology and activities in the Uinta basin. A. M. Carter. *Colo. Sch. Min. Quart.*, July 1953, **43** (3).—The tertiary geology of the paleocene, eiocene, Green River–Wasatch transition, Green River, Uinta, and Duchesne River formations are described. The structure of the Uinta basin is outlined, and brief details are given of the Duchesne, Jack Canyon, and the Strawberry reservoir fault zones. Surface indications of oil, Gilsonite, and other hydrocarbons are discussed. The history of development is outlined, and the activities in the Rooseveldt, Red Wash, Duchesne, Flat Mesa, and County fields are described, and properties of the respective crudes are given. The climatic conditions and transport difficulties in the Uinta basin are discussed. Formation reports of the Red Wash Unit No 4 and Gusher Unit No 5 are recorded. W. H. C.

5. Pennsylvanian cross-sections of Central Oklahoma. Anon. *World Oil*, Feb. 1953, **136** (2), 83.—Cross-sections are the result of 3 years study of well cuttings and electric logs by the Shawnee Geological Society.

Correlations shown are primarily from electrical logs, but sample studies have been made to verify unconformities and questionable points. No attempt has been made to correlate the sub-surface beds with outcrop sections.

Each series is described in detail, the data obtained being used to produce a N–S and an E–W cross-section of the Pennsylvanian. W. S. R.

6. Odd geologic structures of Southern Oklahoma. Pt 1. C. W. Tomlinson. *World Oil*, Dec. 1952, **135** (7), 103.—Recent drilling in Southern Oklahoma has revealed the existence of odd geological structures. These include

WA
PAG

However, by close spacing of the observation points and the breakdown of the observed curves into uniform sections, as well as into lithological structural terms, the sedimentary contrasts in various stratigraphic columns stand out with sufficient clarity to facilitate the differentiation of various lithological units.

Examination of the separate sections of the traverse enables the effects of sands, shales, and limestones to be seen, whilst the depths to various physical discontinuities are easily calculated.

The structure of the Sutton County area is described in detail, and the article includes numerous maps and diagrams.

W. S. R.

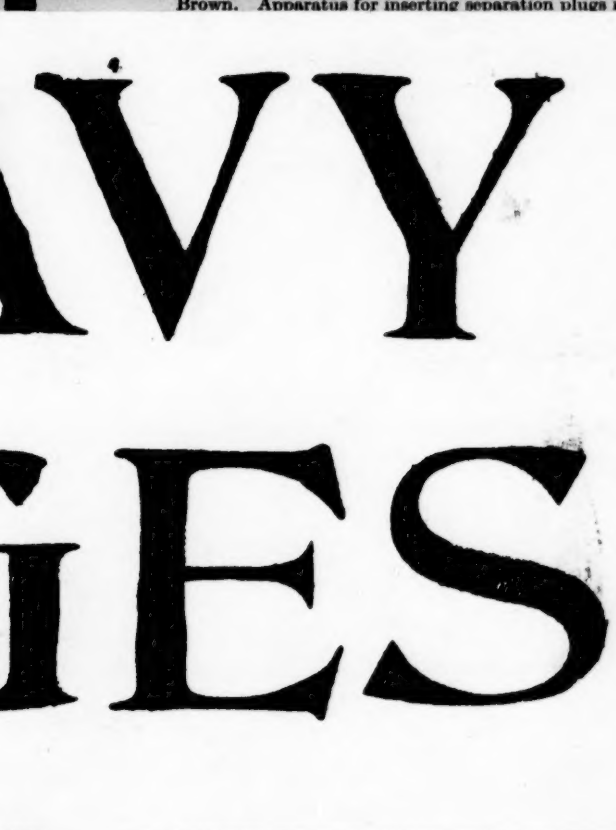
10. Alloyed steel in petroleum industry. J. Wojnar. *Nafta* (*Krakow*), 1952, **8**, 337–9.—A brief analysis of requirements of the petroleum industry shows that steels for drilling should

have good tensile strength, should be hard and resistant to corrosion. For gas and crude pipelines against corrosion resistance is paramount. Several alloys are described. M. S.

11. Mechanism for cutting drill pipe and casing. M. Ringler. *Nafta (Krakow)*, 1952, **8**, 263–5.—Author reviews available methods of cutting pipe and casing, and fully describes his own cutters, which are capable of completing the job in 2½ hr. Diagram given. M. S.

12. Apparatus BeA for extraction of casing from drillhole. A. Bania. *Nafta (Krakow)*, 1952, **8**, 279–80.—Author describes apparatus BeA of his own invention with aid of diagram and suggests a procedure to be followed. M. S.

13. Patents. U.S.P. 2,630,179 (24.6.49; 3.3.53). C. C. Brown. Apparatus for inserting separation plugs in advance



oil wells.

U.S.P. 2,631,729 (13.4.46; 17.3.53). H. N. Osbon. Conditioning device for drilling mud.

U.S.P. 2,631,741 (29.6.50; 17.3.53). S. J. Tucker. Apparatus for feeding lengths of drill pipe to the elevating apparatus of a drilling rig.

U.S.P. 2,631,820 (4.4.51; 17.3.53). J. A. Zublin. Apparatus for drilling curved bores.

U.S.P. 2,631,821 (28.2.52; 17.3.53). J. P. Caldwell. Directional drilling apparatus.

U.S.P. 2,631,822 (13.8.51; 17.3.53). P. M. Ussery. Drill pipe guide roller.

U.S.P. 2,631,823 (21.10.47; 17.3.53). F. E. Dannheim. Pipe driving point.

U.S.P. 2,631,824 (28.12.49; 17.3.53). G. Annesley. Percussive drill bit.

U.S.P. 2,632,514 (24.9.48; 24.3.53). J. J. Fitzpatrick. Tubing packer and hold-down mechanism.

U.S.P. 2,632,515 (14.2.49; 24.3.53). N. T. Breaux. Sealing means for well packers.

U.S.P. 2,632,630 (16.7.49; 24.3.53). L. W. Storm. Automatically operable orienting tool.

U.S.P. 2,632,631 (6.5.49; 24.3.53). H. F. Griffin and R. R. Crookston, assrs to Standard Oil Development Co. Drilling mud flow system.

U.S.P. 2,632,959 (29.5.48; 31.3.53). F. G. Boucher, assr to Standard Oil Development Co. Remote reading orientation apparatus for oil wells.

U.S.P. 2,633,199 (3.5.51; 31.3.53). F. A. Reed, assr to Larkin and Co. Inc. Well packer.

U.S.P. 2,633,201 (7.6.48; 31.3.53). H. F. Clark, assr to Halliburton Oil Well Cementing Co. Well cementing device.

U.S.P. 2,633,330 (5.6.48; 31.3.53). W. C. Carlisle, assr to Macco Oil Tool Co. Rat hole connexion for well drilling rigs. J. M. S.

PRODUCTION

14. Emulsions in petroleum industry and ways of combating them. W. Kisielow. *Nafta (Krakow)*, 1952, **8**, 302–7, 325–31.—Emulsions are unwanted in unfinished product and crude, but many finished products must have the property of easy emulsification. Crudes agitated by production occlude brines which corrode equipment. Water has relatively high sp. vol. of vapour and high sp. ht. of vaporization, which interfere with space and heating economy. Suspended solids cause erosion. Author describes physical causes of emulsion formation and the mol mechanism involved, then mentions cases found in nature when crude is produced from the well. Methods of breaking emulsions are described, and Soviet chemicals are listed. Emulsions formed during acid and alkali refining are described next. They are mostly oil in aq phase, but methods of breaking them are similar to those of aq in oily phases. Initial alkali wash will remove naphthene acids and compounds of S even before dist. Various alternatives to H_2SO_4 refining are given. M. S.

15. Production problems in petroleum industry. M. Lesz. *Nafta (Krakow)*, 1952, **8**, 307–8.—Describes difficulties encountered in completing the first half of the 6-year plan. For 7 months ending 31 July only 98% of plan was reached due to failure of new and deepened wells to reach required production. This in turn was due to inadequate drilling below 1500 m. Newly transferred from U.S.S.R. Ustrzyki region failed to produce its share, due to unpreparedness and poor living conditions. Apart from these particular shortcomings, efficiency in the industry is low generally, although gas and natural gasoline production are up to plan target. M. S.

16. Well-bottom gas burner for underground heating of crude oil deposits. W. Dubis. *Bull. Polish Inst. Petrol.*, 1952, **2**, 10–12, 13–14 (Supplement to *Nafta (Krakow)*, 1952, **8**).—Author lists the practical requirements for such a burner as well as theoretical limits of inflammability. Next comes fairly detailed description of the burner invented by author within his works for the Polish Institute of Petroleum. Included are results of tests carried out between 8 and 14 April 1952 when temp of one reservoir rose from 19° to 28° C and another from 19° to 39°. Some damage to the prototype was easily put right. M. S.

17. Systematic production control in the field as a basis for rational exploitation of crude. C. Hakiel. *Nafta (Krakow)*, 1952, **8**, 209–12, 241–3.—Exploitation of reservoirs falls historically into 3 phases:

1st—spontaneous and inexperienced blind production responding rapidly to market requirements.

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4. A review of the geology and activities in the Uinta basin. A. M. Carter. *Colo. Sch. Min. Quart.*, July 1953, **43** (3).—The tertiary geology of the paleocene, eiocene, Green River–Wasatch transition, Green River, Uinta, and Duchesne River formations are described. The structure of the Uinta basin is outlined, and brief details are given of the Duchesne, Jack Canyon, and the Strawberry reservoir fault zones. Surface indications of oil, Gilsonite, and other hydrocarbons are discussed. The history of development is outlined, and the activities in the Rooseveldt, Red Wash, Duchesne, Flat Mesa, and County fields are described, and properties of the respective crudes are given. The climatic conditions and transport difficulties in the Uinta basin are discussed. Formation reports of the Red Wash Unit No 4 and Gusher Unit No 5 are recorded. W. H. C.

5. Pennsylvanian cross-sections of Central Oklahoma. Anon. *World Oil*, Feb. 1953, **136** (2), 83.—Cross-sections are the result of 3 years study of well cuttings and electric logs by the Shawnee Geological Society.

Correlations shown are primarily from electrical logs, but sample studies have been made to verify unconformities and questionable points. No attempt has been made to correlate the sub-surface beds with outcrop sections.

Each series is described in detail, the data obtained being used to produce a N–S and an E–W cross-section of the Pennsylvanian. W. S. R.

6. Odd geologic structures of Southern Oklahoma. Pt 1. C. W. Tomlinson. *World Oil*, Dec. 1952, **135** (7), 103.—Recent drilling in Southern Oklahoma has revealed the existence of odd geological structures. These include pseudo-plastic folding, close juxtaposition, sediments downfolded below their original position, thickened masses, " rabbit-ears " anticlinoria, and hinge faults.

Each type of structure is described in detail, and there are numerous examples and illustrations. W. S. R.

7. Oil and gas exploration in the Netherlands. W. A. Visser. *Ingenieur, 's Grav.*, 14.8.53, **65** (33), M11–15.—After a short historical survey the author discusses the various methods used in this exploration. A brief exposition of the geological requirements for oilfield formation is followed by an analysis of the actual geological structure of the Netherlands. The conclusion is reached that in this instance the low porosity of the reservoir rocks makes drilling a risky and expensive operation. G. F. T. C.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

8. Surface electrical method detects oil directly. H. M. Evjen. *World Oil*, Feb. 1953, **136** (2), 93.—New technique is an electromagnetic method which indicates the presence of oil by measuring the resistance of sub-surface formations from the surface.

Current used consists of low frequency pulses in alternating direction, with gaps between the pulses. During these gaps all measurements are made, to ensure that the impulse measured has spent an appreciable time travelling through the ground. Shallow responses are eliminated by a process analogous to the suppressor used in seismic work.

Petroleum-bearing strata acquires a high resistivity, whilst the overburden remains unchanged and acts as a mirror. The low frequency electromagnetic wave set up in the ground is reflected by this mirror, and the anomaly which is observed is this reflection. W. S. R.

DRILLING

9. Improved magnetic method can avoid drilling failure. M. Milstein. *World Oil*, Jan. 1953, **136** (1), 87.—The magnetic map is built up on the usual distribution of vertical magnetic intensities, the resulting isograms being of problematic value.

However, by close spacing of the observation points and the breakdown of the observed curves into uniform sections, as well as into lithological structural terms, the sedimentary contrasts in various stratigraphic columns stand out with sufficient clarity to facilitate the differentiation of various lithological units.

Examination of the separate sections of the traverse enables the effects of sands, shales, and limestones to be seen, whilst the depths to various physical discontinuities are easily calculated.

The structure of the Sutton County area is described in detail, and the article includes numerous maps and diagrams. W. S. R.

10. Alloyed steel in petroleum industry. J. Wojnar. *Nafta (Krakow)*, 1952, **8**, 337–9.—A brief analysis of requirements of the petroleum industry shows that steels for drilling should

have good tensile strength, should be hard and resistant to corrosion. For gas and crude pipelines against corrosion resistance is paramount. Several alloys are described.
M. S.

11. Mechanism for cutting drill pipe and casing. M. Ringler. *Nafta* (*Krakow*), 1952, **8**, 263–5.—Author reviews available methods of cutting pipe and casing, and fully describes his own cutters, which are capable of completing the job in 2½ hr. Diagram given. M. S.

12. Apparatus BeA for extraction of casing from drillhole. A. Bania. *Nafta* (*Krakow*), 1952, **8**, 279–80.—Author describes apparatus BeA of his own invention with aid of diagram and suggests a procedure to be followed. M. S.

13. Patents. U.S.P. 2,630,179 (24.6.49; 3.3.53). C. C. Brown. Apparatus for inserting separation plugs in advance of and behind cement in a well pipe.

U.S.P. 2,630,180 (15.8.49; 3.3.53). K. H. Summers. Line operating device for use in gun casing perforating operations.

U.S.P. 2,630,181 (12.8.50; 3.3.53). K. W. Solum. Tubing rotating device for oil wells.

U.S.P. 2,630,864 (19.10.44; 10.3.53). J. Lynes, assr to Lynes Inc. Well formation tool.

U.S.P. 2,630,865 (25.2.49; 10.3.53). J. R. Baker, assr to Baker Oil Tools Inc. Hydraulically operated well packer.

U.S.P. 2,630,866 (23.9.46; 10.3.53). T. M. Ragan, assr to Baker Oil Tools Inc. Bridge plug for wells.

U.S.P. 2,630,998 (24.2.47; 10.3.53). F. H. Lee, assr to Baker Oil Tools Inc. Side ported well casing apparatus.

U.S.P. 2,630,999 (24.2.47; 10.3.53). F. H. Lee, assr to Baker Oil Tools Inc. Well casing cementing apparatus.

U.S.P. 2,631,000 (24.2.47; 10.3.53). F. H. Lee assr to Baker Oil Tools Inc. Side ported well casing cementing collar.

U.S.P. 2,631,012 (3.10.49; 10.3.53). J. F. Kendrick. Method of limiting the stresses in cable tool drilling lines.

U.S.P. 2,631,017 (5.5.47; 10.3.53). R. C. Gibson and J. J. Leggett. Mud and chemical mixer.

U.S.P. 2,631,128 (24.4.50; 10.3.53). R. V. Jones, assr to Phillips Petroleum Co. Water base drilling mud containing a water-sol alkali metal polyvinyl sulphate.

U.S.P. 2,631,270 (19.5.47; 10.3.53). R. W. Goble, assr to Eastman Oil Well Survey Co. Apparatus for determining the cross-sectional area of a well bore.

U.S.P. 2,631,671 (6.5.41; 17.3.53). S. Krasnow and L. F. Curtiss, assrs to Schlumberger Well Surveying Corpn. Means for perforating a casing in a well comprising a perforator, means for moving the same, a marker locating means connected to the perforator, and means for actuating the perforator.

U.S.P. 2,631,672 (9.3.49; 17.3.53). R. H. Blood, assr to Standard Oil Development Co. Inflatable elastic packer for oil wells.

U.S.P. 2,631,729 (13.4.46; 17.3.53). H. N. Osbon. Conditioning device for drilling mud.

U.S.P. 2,631,741 (29.6.50; 17.3.53). S. J. Tucker. Apparatus for feeding lengths of drill pipe to the elevating apparatus of a drilling rig.

U.S.P. 2,631,820 (4.4.51; 17.3.53). J. A. Zublin. Apparatus for drilling curved bores.

U.S.P. 2,631,821 (28.2.52; 17.3.53). J. P. Caldwell. Directional drilling apparatus.

U.S.P. 2,631,822 (13.8.51; 17.3.53). P. M. Ussery. Drill pipe guide roller.

U.S.P. 2,631,823 (21.10.47; 17.3.53). F. E. Dannheim. Pipe driving point.

U.S.P. 2,631,824 (28.12.49; 17.3.53). G. Annesley. Percussive drill bit.

U.S.P. 2,632,514 (24.9.48; 24.3.53). J. J. Fitzpatrick. Tubing packer and hold-down mechanism.

U.S.P. 2,632,515 (14.2.49; 24.3.53). N. T. Breaux. Sealing means for well packers.

U.S.P. 2,632,630 (16.7.49; 24.3.53). L. W. Storm. Automatically operable orienting tool.

U.S.P. 2,632,631 (6.5.49; 24.3.53). H. F. Griffin and R. R. Crookston, assrs to Standard Oil Development Co. Drilling mud flow system.

U.S.P. 2,632,959 (29.5.48; 31.3.53). F. G. Boucher, assr to Standard Oil Development Co. Remote reading orientation apparatus for oil wells.

U.S.P. 2,633,199 (3.5.51; 31.3.53). F. A. Reed, assr to Larkin and Co. Inc. Well packer.

U.S.P. 2,633,201 (7.6.48; 31.3.53). H. F. Clark, assr to Halliburton Oil Well Cementing Co. Well cementing device.

U.S.P. 2,633,330 (5.6.48; 31.3.53). W. C. Carlisle, assr to Macco Oil Tool Co. Rat hole connexion for well drilling rigs.
J. M. S.

PRODUCTION

14. Emulsions in petroleum industry and ways of combating them. W. Kisielow. *Nafta* (*Krakow*), 1952, **8**, 302–7, 325–31.—Emulsions are unwanted in unfinished product and crude, but many finished products must have the property of easy emulsification. Crudes agitated by production occlude brines which corrode equipment. Water has relatively high sp. vol. of vapour and high sp. ht. of vaporization, which interfere with space and heating economy. Suspended solids cause erosion. Author describes physical causes of emulsion formation and the mol mechanism involved, then mentions cases found in nature when crude is produced from the well. Methods of breaking emulsions are described, and Soviet chemicals are listed. Emulsions formed during acid and alkali refining are described next. They are mostly oil in aq phase, but methods of breaking them are similar to those of aq in oily phases. Initial alkali wash will remove naphthene acids and compounds of S even before dist. Various alternatives to H_2SO_4 refining are given. M. S.

15. Production problems in petroleum industry. M. Lesz. *Nafta* (*Krakow*), 1952, **8**, 307–8.—Describes difficulties encountered in completing the first half of the 6-year plan. For 7 months ending 31 July only 98% of plan was reached due to failure of new and deepened wells to reach required production. This in turn was due to inadequate drilling below 1500 m. Newly transferred from U.S.S.R. Ustrzyki region failed to produce its share, due to unpreparedness and poor living conditions. Apart from these particular shortcomings, efficiency in the industry is low generally, although gas and natural gasoline production are up to plan target. M. S.

16. Well-bottom gas burner for underground heating of crude oil deposits. W. Dubis. *Bull. Polish Inst. Petrol.*, 1952, **2**, 10–12, 13–14 (Supplement to *Nafta* (*Krakow*), 1952, **8**).—Author lists the practical requirements for such a burner as well as theoretical limits of inflammability. Next comes fairly detailed description of the burner invented by author within his works for the Polish Institute of Petroleum. Included are results of tests carried out between 8 and 14 April 1952 when temp of one reservoir rose from 19° to 28° C and another from 19° to 39°. Some damage to the prototype was easily put right. M. S.

17. Systematic production control in the field as a basis for rational exploitation of crude. C. Hakiel. *Nafta* (*Krakow*), 1952, **8**, 209–12, 241–3.—Exploitation of reservoirs falls historically into 3 phases:

1st—spontaneous and inexperienced blind production responding rapidly to market requirements.

2nd—marked by introduction of production measurement and control and consequent discovery of certain reservoir laws, but it yields only 10–20% of crude available.

3rd—a thoroughly scientific phase, yielding 30–80% of deposits.

Present Polish state of affairs falls at the transition from 2nd to 3rd. To facilitate this, full production control is required, but since no expensive equipment can be afforded, simple flow rate, pressure, and temp measurements must be made, gas recycled and gas to liq ratio maintained between 200 and 400 cu. m/ton. Once this is accomplished steps must be taken to enter into the 3rd phase by provision of scientifically trained staff and laboratory facilities. M. S.

18. The Rumanian oil industry. J. Cardew. *Petroleum, Lond.*, Aug. 1953, **16** (8), 211–13.—A review of the industry from its earliest days is given. With post-war development, production should reach pre-war peak level shortly. G. H. G.

OILFIELD DEVELOPMENT

19. Exploratory drilling remains high after slight decline. Anon. *World Oil*, Jan. 1953, **136** (1), 100.—965 exploration wells were drilled during November, of which 179 tests were commercial producers.

November's successes included the discoveries of 126 new pools, 93 were new fields, and 33 new pay zones.

Drilling results for the month and the preceding 11 months are tabulated by districts. W. S. R.

20. Exploratory drilling sets new record during 1952. Anon. *World Oil*, Feb. 1953, **136** (2), 98.—Exploratory wells totalled 11,051, compared with 10,982 during 1951. Of these 17·8% or 1970 tests were commercial producers, there being 1284 new oil discoveries, composed of 984 new oil pools and 300 new pay horizons.

132 new dist pools were recorded (110 new fields and 22 new pay zones).

Results are tabulated, by districts, for December and the whole of 1952. W. S. R.

21. Tests prove discovery at Sturgeon Lake. G. M. Wilson. *World Oil*, Feb. 1953, **136** (2), 246.—High gravity oil has been discovered by a wildcat well in the Peace River region 185 miles N.W. of Redwater.

Production (gas and 35° API oil) comes from a D3 reef believed to be equivalent to the D3 zone found at Redwater, having 75–90 ft water-free reef at 6255 ft sub sea.

Drilling, completion, and production data are given. W. S. R.

22. New discoveries spur Saskatchewan exploration. M. Kamen-Kaye. *World Oil*, Dec. 1952, **135** (7), 326.—Although intensive exploration began only 3 years ago, by early 1952 several important discoveries had been made.

The Forsterton field, discovered in early 1952, produced 24 ft of oil from a pay thickness of 30–40 ft at a depth of 3060–3100 ft. The producing sand—the Roseray sand—is believed to be the basal member of the Blairmore group (Lower Cretaceous). By October 1952 19 wells had been drilled, 10 of them being dry.

In May 1952 the Viking Sand was brought into production in the Brock area, Brock 2, flowing with a potential of 40 M.c.f.d.

At Ratcliffe 100 miles southeast of Regina a drill-stem test produced 5 ft of 35-ft oil. By controlled mechanical conditions it was thought possible to increase production.

Numerous stratigraphical and palæontological maps are included. W. S. R.

23. Highlights of Venezuelan oil activities, 1948–1952. C. P. de la Cova. *Petrol. Times*, 18.9.53, **57** (1464), 948.—Drilling production and reserves, progress in use of natural gas, and increase in pipeline capacity are reviewed for the period. G. A. C.

24. New oil developments in Pakistan. Anon. *Petroleum, Lond.*, Sept. 1953, **16** (9), 250–1.—Account of the opening of the first test-well in the Zin mountain area. For year ending 1952, 8 test wells proved successful. G. H. G.

TRANSPORT AND STORAGE

25. How to clean storage tanks. R. P. Robinson and E. W. Hudgens. *Petrol. Engr*, April 1953, **25** (4), C16.—By using chemical solvents, advantages over mechanical methods are: (1) speed; (2) less hazardous; (3) more efficient and thorough cleaning job. This use of solvents is particularly useful when a tank is converted from crude oil to a refined product. 2 principal methods are employed; with a small tank the units are filled with solvent, reaction of chemicals or unwanted deposits is allowed to proceed to completion, the tank is drained, and the cleaned surfaces are passivated to minimize oxidn.

With a large tank, a thickened chemical soln is sprayed on to the inside or outside of the tank, which is flushed off after cleaning. To remove paint, thickened solvent contains methylene chloride. Specially formulated alkaline soln are applied at high pressure to remove oils and greases. A number of varying and successful examples are given. G. H. G.

26. A development in tank heating coils. Anon. *Petroleum, Lond.*, Aug. 1953, **16** (8), 223.—To reduce the high cost of maintenance of the tank heating coils in an oil tanker, it has been found that the most suitable material is cast iron, the pipes being of cruciform section. G. H. G.

27. Iraq oil pipelines. V. S. Swaminathan. *Engineer, Lond.*, 1953, **196**, 234–8.—Two 12-inch lines from Kirkuk (Iraq) to Haifa and Tripoli on Mediterranean seaboard completed by 1934, capacity 4 million tons/year. Two 16-inch lines along same routes commenced in 1946, northern line to Tripoli completed 1949, but Haifa line not completed. Further 30/32-inch line, 550 miles long, from Kirkuk to Banias (north of Tripoli) completed 1952, now handling 13 million tons/year. Details given of pipe laying and protection, pumping stations, and terminal equipment. Zubair oilfield of Basrah Petroleum Co in S.E. Iraq connected to Fao on Persian Gulf by 72-mile, 12-inch line, carrying about 2 million tons/year. New 24-inch line under construction, planned output from end of 1955 is 8 million tons/year. Mosul Petroleum Co's field at Ain Zalah discharges via 134-mile, 12-inch line to main Kirkuk–Banias line, making total Iraq production 30 million tons/year by 1955. A. C.

28. The struggle against natural (storage) losses of petroleum products as a source of economy. P. Lipka. *Nafta (Krakow)*, 1952, **8**, 280–3.—U.S.S.R. limits for storage losses are given as guidance. It is wrong to accept excessive losses as a physical phenomenon. Their causes once discovered can be overcome. To combat evaporation losses tanks must be airtight and filled as high as permissible with the smallest surface area. Aluminium paint on tanks causes the losses to be 25% less than in those painted black. M. S.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

29. European refinery capacity up. Anon. *Petrol. Refin.*, 1953, **32** (8), 138.—A brief summary of the third report of oil refinery expansion in OEEC countries. Estimated crude throughput will average 1,700,000 b.d. at the end of 1953 and 1,900,000 b.d. a year later. R. D. S.

30. New type of flare stack for British oil refineries. Anon. *Petroleum, Lond.*, July 1953, **16** (7), 181.—New type of supporting mast for the flare stack chosen for 2 reasons: economically—it is only ⅔ steel weight of a comparable self-supporting structure; and secondly, it is more stable on the marshy sites involved. Cross-sectional area of stack is based on a max waste gas flow of 1½ million cu. ft/hr. The supporting mast structure and foundations are described. It was necessary to inject steam into the flare tip of one stack to minimize the amount of smoke. Waste gases are ignited by a constantly burning pilot flame at the mouth of the flare tip, which is relighted by an electrically operated stainless steel propagation tube. G. H. G.

31. The Aden refinery. Anon. *Petroleum, Lond.*, July 1953, **16** (7), 191.—General review of the refinery to go on stream in 1954, to process 5 million tons of crude p.a. G. H. G.

32. Refinery gasoline desulphurized. H. J. Burns and C. L. Corcuera. *Petrol. Refin.*, 1953, **32** (7), 118.—A description of the Petroleos Mexicanos refinery at Mexico City, which was rebuilt in 1945 to handle 55,000 b.d. crude. A feature is the cycloversion unit, which operates at 800° F with a nominal capacity of 12,000 b.d. and removes sulphur compounds from the straight-run gasoline giving an improvement of 10 Research octane numbers at the 3 ml T.E.L. level in the debutanized product. R. D. S.

33. Pressure, temperature, alloys. F. L. Rubin. *Chem. Engng*, 1953, **60** (7), 177–81.—These are the prime factors affecting heat exchanger costs and data are supplied showing the relationship between these factors and cost for several designs. D. M.

34. Combined firing in steam generators. Anon. *Petroleum, Lond.*, June 1953, **16** (6), 159–60.—Oil firing can be used for supplying additional heat to boiler plant,where there is sufficient turbine plant to use the increased steam output. Oil burners installed on boilers are considered to attain higher furnace temp and more complete combustion. Burner unit is described. Capacity is 400 lb oil/hr generating 4200 lb steam/hr. Ignition of oil is obtained by hand torch on initial starting. Oil burnt is heavy fuel oil, 960 sec Redwood No. 1 visc. Effects of the oil are boost discussed, and advantages given. The expected increase in fuel cost per unit sent out has not been experienced in practice. G. H. G.

35. Cooling pond may answer your water cooling problem. J. W. Langhaar. *Chem. Engng*, 1953, **60** (8), 194–8.—The advantages of this cooling system are mentioned, together with a method of design requiring the use of design charts and certain data which are included in the text. D. M.

36. An economic comparison of electric motors vs steam turbines for FCCU. H. C. Mayo. *Petrol. Refin.*, 1953, **32** (8), 96–100.—An analysis of the investment and operating costs, flexibility of operation, and operating record of steam turbine and electric motor drivers on cat cracking units. R. D. S.

37. Reactor inspected by isotopes. Anon. *Petrol. Refin.*, 1953, **32** (8), 126.—A brief account of the use of Iridium 192 in the detection of hydrogen blisters in the steel of a refinery reactor unit. R. D. S.

38. Solve for vessel thickness graphically. J. A. Hunter. *Petrol. Refin.*, 1953, **32** (7), 112.—A graph based on the ASME code is presented for the determination of shell and head thicknesses of vessels under internal pressure. R. D. S.

39. Ultrasonics in the testing of metal plates and welds. Anon. *Petrol. Times*, 18.9.53, **57** (1464), 1935.—The use of ultrasonics at the Monk Bretton Works of W. J. Fraser Ltd in the construction of welded pressure vessels is described. Positive and reliable results are claimed by the method for examination of welds for faults. A diagram illustrates the appearance of typical faults as they are shown on the cathode ray tube. G. A. C.

40. The importance of study of chemical engineering "unit operations" with regard to the development of new processes. H. Hoog. *Ingenieur, 's Grav.*, 21.8.53, **65** (34), 65–75.—Research work in the laboratory and chemical engineering office is an essential step in the development of a plant process, and determines the choice of the pilot plant equipment required for carrying out a given operation. This principle is illustrated by means of a fairly extensive survey of the preliminary work carried out in the development of 3 modern refinery processes, viz., sulphation of olefins for detergent manufacture, fluidized bed cat cracking, and hydrodesulphurization. 11 graphs and flow diagrams and 17 literature refs are included. G. F. T. C.

41. Investigation on the capacity and operation of a continuous, triple-effect film evaporator. P. M. Heertjes, J. Nijman, and M. P. Vogel. *Ingenieur, 's Grav.*, 7.8.53, **65** (32), 47–62.—After briefly explaining the principle of multi-effect evaporation, the author investigates the 4 principal points determining the performance of a film evaporator, *i.e.*, the formation and maintenance of thin liq films on a cyl wall, the behaviour of a liq film on a heated surface, and the influence of the temp difference heating steam/cooling water on the capacity of the evaporator. The results of contact angle measurements on a series of metals after various surface treatments are given. It is shown that surface conditions giving max heat transfer are not consistent with the low contact angle values required for obtaining max spreading and superheating. Boiling of the film is detrimental as it causes entrainment of liquor in the condensate. The capacity of the apparatus is proved to be proportional to the temp difference steam–water. Liq is transferred from one section to another by making use of the existing pressure differences. Operation is smooth when filtered soln are used and all conditions are kept constant. Great sensitivity to slight changes in operation conditions is a drawback. 9 graphs and constructional drawings, 8 tables, and 2 complete log sheets of actual runs are included. G. F. T. C.

42. Patents. U.S.P. 2,630,413 (31.12.48; 3.3.53). L. J. Weber, assr to Phillips Petroleum Co. Pebble heater apparatus and method of regenerating contaminated pebbles.

U.S.P. 2,631,015 (8.4.52; 10.3.53). W. H. Probst, assr to Shell Development Co. Continuous helical liner for vessels.

U.S.P. 2,631,091 (21.5.49; 10.3.53). W. E. Kuentzel and E. Field, assrs to Standard Oil Co. Apparatus for contacting separate phases at controlled temp and high pressure.

U.S.P. 2,631,353 (13.6.49; 17.3.53). S. P. Robinson, assr to Phillips Petroleum Co. Pebbles for moving-bed heat-transfer purposes are made by forming a homogeneous mixture of alumina and a vanadium compound (0·2 to 5·0% wt), compacting the mass into balls and calcining at 2900° to 3200° F.

U.S.P. 2,631,835 (26.4.48; 17.3.53). E. L. Jones, assr to Phillips Petroleum Co. Apparatus for heating gases using a molten solid heat exchange material.

U.S.P. 2,632,395 (2.6.48; 24.3.53). G. P. Jennings and L. P. Meade, assrs to Phillips Petroleum Co. Heat exchange assembly for centrifugal pumps.

U.S.P. 2,632,523 (19.1.51; 24.3.53). F. M. Stephens and J. R. Fluor, assrs to Fluor Corpn. Gas separator.

U.S.P. 2,632,638 (26.3.49; 24.3.53). N. C. Turner, assr to Hudson Engineering Corpn. Tower apparatus for contacting gas and liq.

U.S.P. 2,632,689 (3.11.44; 24.3.53). J. W. Latchum, assr to Phillips Petroleum Co. Gas turbine apparatus for continuously effecting chemical reactions.

U.S.P. 2,632,720 (6.12.47; 24.3.53). S. F. Perry, assr to Standard Oil Development Co. Apparatus for countercurrent contacting of solids with liq.

U.S.P. 2,633,477 (24.9.46; 31.3.53). W. F. Rollman, assr to Standard Oil Development Co. Apparatus for carrying out cat reactions using a rotating cyl cat. J. M. S.

Ger.P. 876,395, 2.4.53. Gärtner, Hannover-Linden, assr to Körting Maschinen u. Apparatebau A.G., Hannover-Linden. Pure condensate and heat recovery by thermocompression.

Ger.P. 876,438, 2.4.53. Brümmerhof, Remscheid-Lennep. Enclosed combustion chamber.

Ger.P. 877,050, 2.4.53. Seidl, Oberhausen, assr to Deutsche Babcock & Wilcox, Dampfkesselwerke A.G. Oberhausen. Radiation steam generator with ignition belt.

Ger.P. 876,882, 2.4.53. Escher Wyss Maschinenfabrik, Ravensburg. Installation for heating a heat conductor.
BrennstChemie, 1953, **34** (9–10). R. T.

DISTILLATION

43. What every engineer should know about packed tower operations. F. A. Zenz. *Chem. Engng*, 1953, **60** (8), 176–84.—The significance and interrelation of 6 major considerations are discussed. Namely, pressure drop curves, flooding point, pressure drop at flooding, the gas continuous range, the liq continuous range, and degree of wetting. D. M.

44. Thermodynamic data for low temperature design. D. L. Katz, R. H. Schatz, and B. Williams. *Petrol. Refin.*, 1953, **32** (8), 101–4.—A brief review of data available on vapour–liq equilibria, densities, visc, and thermal properties at pressures approaching the apparent convergence pressure, *i.e.*, the operating region of low temp plants. 50 refs. R. D. S.

ABSORPTION AND ADSORPTION

45. Refining with adsorbents. Pt II. V. A. Kalichevsky and K. A. Kobe. *Petrol. Refin.*, 1953, **32** (7), 119–22.—Discusses the efficiency of adsorbents and how it is measured in the laboratory, the theory of adsorption, the decolorizing and desulphurizing properties, and the latest developments in the use of adsorbents for the separation of petroleum fractions. R. D. S.

46. Adsorption index. T. W. Legatski, J. W. Tooke, and L. A. Grundy. *Petrol. Refin.*, 1953, **32** (7), 155–8.—An account of a simple and rapid method for estimating the amount of butane and heavier content of a natural gas with a precision of + or − 5% based on fractional analysis. The gas is contacted with *n*-octane under specified conditions for 30 min in a closed cell, and the final pressure is a measure of the original gas composition, and is called the absorption index of the sample. R. D. S.

47. Patent. Ger.P. 877,445, 9.4.53. Rudbach and Rogge, assrs to Bamag-Meguin A.G., Berlin. Process and plant for adsorption of gases and vapours by pulverulent adsorbent, *e.g.*, activated C or silica gel with subsequent desorption under circulation of adsorbent.
BrennstChemie, 1953, **34** (11–12). R. T.

CRACKING

48. Visualizing gas–solid dynamics in catalytic processes. F. A. Zenz. *Petrol. Refin.*, 1953, **32** (7), 123–8.—A detailed consideration of the relation between pressure drop and gas velocity and the physical conditions present in a gas–solid system in both horizontal and vertical pipes. The conditions are presented by means of " phase diagrams," and the method is extended to cover the conditions found in various parts of plants using gas–solid systems such as fluid cat cracking. R. D. S.

49. Catalysis in petroleum refining. G. Egloff. *Combustibles (Zaragoza)*, 1953, **13**, 104–16.—See Abs. 1357 of 1953.

50. Patents. Ger.P. 877,744, 9.4.53. Lauth, assr to Farbenfabriken Bayer, Leverkusen-Bayerwerk. Method for producing coarse, lumpy, and if necessary, moulded fatty acids for cat purposes.

Ger.P. 877,599, 9.4.53. Müller-Conradi and Sönksen, assrs to BASF, Ludwigshafen (Rhein). Method for cat production of higher alcohols.
BrennstChemie, 1953, **34** (11–12). R. T.

HYDROGENATION

51. Patents. Ger.P. 876,839, 2.4.53. Method for producing knockproof petrols from heavy gasoline or middle oils by cat pressure hydrogenation.

Ger.P. 876,408, 2.4.53. Paul, Versailles and B. and M.N.M. Joseph Paris, assrs to Soc. des Usines Chimiques Rhône-Poulenc, Paris. Process for cat hydrogenation of org compounds.
BrennstChemie, 1953, **34** (9–10). R. T.

ALKYLATION

52. Catalytic properties of silicon tetrafluoride. Alkylation of benzene by alcohols at high temperatures and pressures. A. V. Topchiev and F. N. Bogomolova. *Doklady Acad. Nauk S.S.S.R.*, 1953, **88**, 691–2.—Liability of SiF_4 to hydrolyse should remove H_2O from alc and HF formed should catalyse alkylation by the resultant olefin. Tests with methyl, ethyl, *iso*propyl, *iso*butyl, and *iso*amyl alc showed no reaction at room temp and atm pressure. On raising temp to 200°–320° C and pressure to 2000–2700 atm alkylation occurred with *iso*propyl and *iso*butyl alc, some polymerization of the olefin also took place. V. B.

ISOMERIZATION

53. Separation of isometric hydrocarbons. Anon. *Petroleum, Lond.*, June 1953, **16** (6), 151–2.—Extractive crystallization, a new process for separation of hydrocarbons by type, shows great promise, although the method has not yet entered into commercial operation. Process based on ability of urea to form crystalline complexes with straight chain paraffins only, and a similar tendency exhibited by thiourea for formation of well-defined solid adducts with *iso*paraffins. Method of extraction given.

Stability of addition compounds increases as paraffin chain lengthens, resulting in preferential crystallization with hydrocarbons of higher mol. wt.

Most petroleum fractions contain inhibitors to adduct formation, such as sulphur compounds, peroxides, etc. Activator is not required with pure hydrocarbon to form urea–alkane adduct. Presence of impurities prevents direct formation of urea–paraffin complexes, which may be overcome by adsorption of inhibitors on silica gel, or by addition of sufficient quantity of activator to mixture. Formation of crystalline additive accompanied by evolution of heat, and cooling is provided to prevent dissociation of co-ordination compound. Hydrocarbons of 95% purity are obtained, which may be boosted to 98–99% by raising the solvent circulation rate. Process described. G. H. G.

CHEMICAL AND PHYSICAL REFINING

54. The Shell hydrodesulphurization process. Anon. *Petroleum, Lond.*, Aug. 1953, **16** (8), 220–2.—Desulphurization of straight-run and cracked petroleum fractions is accomplished by passing oil in the liq phase, together with hydrogen, downward through a bed of cobalt–molybdenum bauxite

cat or a tungsten–nickel sulphide cat. This " trickle-phase " process not only increases the scope of application, but the hydrogen recycle rate is reduced to a fraction of that required for vapour phase operation. A description of the process is given with a flow diagram. Details of the commercial application for desulphurizing straight run dist, improving flashed dist as cat-cracking feedstocks, upgrading cat cracked light gas oil are included. Utility requirements and economics of the process are given in table form. G. H. G.

55. Patents. U.S.P. 2,624,694 (27.5.46; 6.1.53). H. R. Sailors, assr to Phillips Petroleum Co. Continuous process for removing H_2S from hydrocarbons by contacting with a saturated soln of cadmium sulphate in aq sulphuric acid containing 25–75 wt % H_2SO_4, separating cadmium sulphide-containing liq and regenerating it by heating to 200°–300° F to expel H_2S and recycling cadmium sulphate soln.

U.S.P. 2,626,232 (16.7.49; 20.1.53). R. M. Love, assr to Standard Oil Development Co. A sour pet dist b.p. $<700°$ F contacted in a ferrous metal container with an alk hypochlorite soln containing >90 g free alkali metal hydroxide and 1–5 g available chlorine per litre.

U.S.P. 2,626,890 (18.10.49; 27.1.53). G. W. Ayers and E. E. Harton, assrs to Pure Oil Co. Water-white hydrocarbon liq containing mercaptans *A* is agitated with an alk soln of a sulphonated napthoquinone, naphthohydroquinone, or an alkyl, phenyl, or alkoxy derivative to accelerate oxidn of *A* to disulphides, the mixture being aerated.

U.S.P. 2,626,891 (6.10.50; 27.1.53). E. R. Quiram and J. B. Lewis, assrs to Standard Oil Development Co. Gasoline is refined by treating with lead tetra-acetate and separating the resulting ppt.

U.S.P. 2,625,503 (15.4.50; 13.1.53). F. A. Apgar, assr to Sinclair Refining Co. Disulphides produced in a copper chloride sweetening process, which dissociate below the end b.p. of the finished stock are removed continuously with added hydrocarbons (8–20 wt % on treated dist) forming a bottoms fraction in the dist step. V. P. P.

Ger.P. 877,301, 9.4.53. Schuster and Eilbracht, assrs to Chemische Verwertungs Gesellschaft Oberhausen m.b.H., Oberhausen-Holten. Process for purifying org products containing O_2 produced by reaction of CO and H_2.

BrennstChemie, 1953, **34** (11–12). R. T.

SPECIAL PROCESSES

58. Oils from coal. Anon. *Engineer, Lond.*, 1953, **196**, 278.—Fuel Research Station of D.S.I.R. has carried out research and development work on Fischer–Tropsch process since 1935. 2 fluidized and 4 liq-phase units available. In latter, cat suspended in molten wax and synthesis gas ($CO + H_2$) passed through suspension. In current work radioactive carbon used as tracer. Process can normally only compete with petroleum oil where cheap coal available; one plant of 200,000 tons/year now under construction in S. Africa, and similar plant in S. Rhodesia being considered. A. C.

57. Phenol synthesized from cumene. Anon. *Oil Gas J.*, 14.9.53, **52** (19), 136.—A brief description is given of the first commercial unit to synthesize phenol from cumene. The plant is situated at Montreal, Canada, and has a rated capacity of 13,000,000 lb phenol per year. The cumene stock is locally produced. G. A. C.

58. Patents. U.S.P. 2,626,243 (29.5.48; 20.1.53). A. L. Jacoby, assr to National Aluminate Corpn. Foaming in steam generators is minimized by adding a non-ionic diether of a polyoxy alkylene glycol (alkylene = ethylene and/or propylene) of average mol. wt. ≤ 500.

U.S.P. 2,625,517 (19.10.51; 13.1.53). J. R. Caldwell, assr to Eastman Kodak Co. Oil-in-water emulsions are coagulated by adding a water-sol salt of cellulose sulphate *A* (0·01–5%, based on weight of oil phase) under conditions whereby *A* is dissolved in the aq phase.

U.S.P. 2,624,713 (24.9.49; 6.1.53). F. R. Hurley, assr to Monsanto Chemical Co. Aromatizing cat comprising a mixture of iron and manganese fluorides obtained by reacting an iron compound and a manganese compound with oxygen and a volumetric excess of hydrogen fluoride.

U.S.P. 2,626,287 (21.11.49; 20.1.53). L. C. Bearer, assr to Phillips Petroleum Co. Pebble heater apparatus and method of operation.

U.S.P. 2,625,466 (17.2.50; 13.1.53). I. Williams, assr to J. M. Huber Corpn. Apparatus for carbon black manufacture comprises a combustion chamber *A* in which the distance between the end walls is 0·25–2 times that between opposite side walls, the exit end wall having a central outlet orifice, of cross-sectional area (csa) 5–25% of csa of *A*, leading to a reaction chamber *B* having a csa 5–100%, and a vol 45% of that of *A*. Gaseous fuel mixed with oxygen-containing gas (90–125% of amount for complete combustion) is injected into *A* at several points adjacent the side walls at a rate such that the gases have a space velocity of 150–600 cu. ft/cu. ft/min. The gases impinge on the end wall, thereby acquiring violent turbulent flow, and then pass through the exit orifice into *B*. An expanding cone of gaseous hydrocarbon is simultaneously introduced into *B* into the turbulent gases, and the mixture passed through and out of *B* and carbon black separated.

U.S.P. 2,626,209 (28.12.48; 20.1.53). C. E. Morrell, assr to Standard Oil Development Co. Fuel mixtures containing hydrocarbon–sol ketones are prepared by contacting one part of a mixture of water-miscible, oxygenated org compounds *A*, including alcohols, aldehydes, ketones, esters, and carboxylic acids having up to 10 carbon atoms, admixed with 3–20 parts of steam on a molal basis, at 360°–600° C with a solid ketonizing cat consisting essentially of mixed iron and manganese oxides whereby *A* are converted to ketones, extracting the aq liq so obtained with a hydrocarbon fraction to remove sol ketones, and drying the extract.

U.S.P. 2,626,288 (6.1.50; 20.1.53). L. J. Ronayne, assr to Phillips Petroleum Co. In dehydrogenation of olefins by contacting with a particulate iron-oxide cat in presence of a diluent (olefin : diluent = 1 to 18), the normal on-stream flow rate being *ca* 5000 cu. ft/vol cat/hr, the cat bed is preconditioned by passing diluent and olefin in ratio *ca* 6 : 1 at a flow rate of ≥ 500 cu. ft/vol cat/hr until cat particles have become fixed in relation to each other due to deposition of coke.

U.S.P. 2,626,274 (19.6.48; 20.1.53). R. F. Vandaveer, assr to Stanolind Oil and Gas Co. A Fischer–Tropsch cat is prepared by adding 0·1–2·5% of an alkali metal $C_{<8}$ sulphonate in aq soln to finely divided iron cat, drying the cat and heating it in a reducing gas at 700° F/>1 atm.

U.S.P. 2,626,275 (18.2.47; 20.1.53). F. W. Sullivan, assr to Hydrocarbon Research Inc. In a Fischer–Tropsch process using fluidized cat disposed in a reaction zone in contact with a heat exchanger, the cat is mixed with inert particles of the same fluidizing characteristics to increase the vol of fluidized dense phase and increase cooling, the max unit charging rate of reactants/unit of cat also being increased.

U.S.P. 2,626,246 (29.1.49; 20.1.53). E. A. Naragon, J. H. Vergilio, and A. J. Millendorf, assrs to Texas Co. Spent cobalt cat used in the OXO process is regenerated by contacting with a mixture of 1–25% oxygen and 75–99% nitrogen at 100°–400° F for ≤ 4 hr.

U.S.P. 2,625,470 (8.8.46; 13.1.53). G. Roberts, assr to Stanolind Oil and Gas Co. Production of synthesis gas by partly reforming hydrocarbon feed gas mixed with carbon dioxide in a first stage heated by convection, passing the mixture with additional CO_2 to a second stage at a higher temp and passing the whole mixture to a final highest temp stage heated by radiation to produce a mixture predominating in CO and H_2.

U.S.P. 2,625,465 (23.10.47; 13.1.53). T. Dresser and R. B. Smith, assrs to Sinclair Refining Co. Oxygen mixed with carbon oxides is continuously passed through a coke bed at 1000°–1300° C, the effluent CO cooled, and a portion con-

tinuously recycled to the coke bed in admixture with oxygen at a rate 200–300% that at which CO is generated.

U.S.P. 2,624,711 (18.11.48; 6.1.53). H. V. Williamson, assr to Cardox Corpn. Method of producing inert gases wherein a high velocity air stream is delivered to the space above a burning bed of coke and 6–10 vol of hot combustion gases per vol of air are entrained therein, the resulting mixture being passed upwards through the coke bed to produce carbon dioxide with traces of monoxide, the temp being controlled so that carbon monoxide will be converted to dioxide. Gaseous products not entrained are withdrawn. V. P. P.

Ger.P. 873,088, 26.2.53. L. Rössig and H. Zorn, assrs to Bad. Anilin- & Soda-Fabr (I.G. Farbenindustrie A.G. "in dissolution"), Ludwigshafen (Rhein). Production of esters.

Ger.P. 872,945, 26.2.53. W. Seidenfaden and H. Albert, assrs to Naphthol-Chemie Offenbach, Offenbach (Main). Production of diazonium compounds.

Ger.P. 872,946, 26.2.53. M. Meister and G. Mauthe, assrs to Farbenfabriken Bayer, Leverkusen-Bayerwerk. Method for producing condensation products.

BrennstChemie, 1953, **34** (7–8).

Ger.P. 877,298, 9.4.53. Braunkohle-Benzin A.G., Berlin. Process for hydrocarbon synthesis from CO and H_2.

BrennstChemie, 1953, **34** (11–12). R. T.

METERING AND CONTROL

59. New flow meter measures true mass rate. Y. T. Li and P. A. Lapp. *Petrol. Refin.*, 1953, **32** (8), 119–22.—A description of a new type of meter which measures mass flow-rate directly and accurately with a high speed of response and gives an output signal which varies linearly with flow-rate. The meter actually measures the moment required to apply a Coriolis acceleration to the fluid, and since this is independent of the properties of the fluid, the meter can be calibrated without passing a known fluid through it. R. D. S.

60. Electrical problems in petrochemical process control. D. J. Pompeo. *Petrol. Refin.*, 1953, **32** (8), 127–30.—A discussion of the problems associated with the latest types of control instruments, including the use of fast acting controls, explosion proofing, and frequency response technique. R. D. S.

61. Valve position indicator. R. P. Nuki. *Petroleum, Lond.*, July 1953, **16** (7), 196.—Shows how many turns a valve is open when the flow line is not equipped with a flow meter. It can be fitted to any standard valve, whether with rising or non-rising spindle. G. H. G.

PRODUCTS

CHEMISTRY AND PHYSICS

62. Understanding the chemistry of petrochemical reactions. Pt III. Non-hydrocarbon constituents of petroleum–oxygen-compounds. L. F. Hatch. *Petrol. Refin.*, 1953, **32** (7), 110–11.—A brief account of the aliphatic, naphthenic, and cresylic acids found in crudes and of their recovery. R. D. S.

63. Understanding the chemistry of petrochemical reactions. Pt IV. Oxidation of hydrocarbons. L. F. Hatch. *Petrol. Refin.*, 1953, **32** (8), 123–5.—An account of the reactions and reaction theories involved in hydrocarbon oxidn. R. D. S.

64. A spectroscopic study of hydrogen bonding in performic and peracetic acids. P. A. Giguère and A. W. Olmos. *Canad. J. Chem.*, 1952, **30**, 821–30.—The infra-red spectra of conc performic and peracetic acids were measured in the region 2–14 μ. It is concluded that intra-molecular hydrogen bonding results in particularly stable 5-membered rings. J. G.

65. The reaction of active nitrogen with propylene. G. S. Trick and C. A. Winkler. *Canad. J. Chem.*, 1952, **30**, 915–21.—The products of the reaction of active nitrogen with propylene are mainly hydrogen cyanide and ethylene with small amounts of ethane and propane and traces of acetylene. Tables are given showing the relation between the products and changes in temp and flow rate. The mechanism is discussed. J. G.

ANALYSIS AND TESTING

66. A new ultrasonic flaw detector. Anon. *Petroleum, Lond.*, Sept. 1953, **16** (9), 263.—Useful additions to a new detector are listed. Units are calibrated in either centimetric or inch scales, with facilities allowing for recalibration for metals other than steel. Latest addition to equipment allows a specimen of large bulk to be tested, in which the area of interest is restricted. G. H. G.

67. Learning how to use dimensional analysis. Pt IV. The Buckingham Pi theorem. I. H. Silberberg and J. J. McKetta. *Petrol. Refin.*, 1953, **32** (7), 129–33.—The final part of the series states the Pi theorem and gives examples of this method of collecting variables into dimensionless groups and also discusses the application of dimensional analysis to a problem by showing the initial method of analysis, the determination of the minimum amount of data needed, and the method of correlation. R. D. S.

68. Save LTFD calculation time with these sheets. W. F. Krause, A. C. Dystrup, and K. A. Buchanan. *Petrol. Refin.*, 1953, **32** (8), 115–18.—Presents a standardized method of recording and calculating low temperature analysis results which is claimed to increase the speed and accuracy of calculation and facilitate the training of new operators. R. D. S.

69. LTFD calculation procedures. S. T. Preston. *Petrol. Refin.*, 1953, **32** (8), 109–14.—The basic relationship required for the calculation of results of low temperature fractional analysis is derived. The modifications needed for the various types of equipment are developed and the importance of the correction factors discussed. R. D. S.

70. Chromo-thermography as a method for separation of simple hydrocarbons. B. V. Aivazov and D. A. Vyakhirev. *Zhur. Priklad. Khim.*, 1953, **26**, 505–511.—Chromo-thermography is variant of chromatography whereby thermal desorption is performed simultaneously with development of chromatogram. In experimental lay-out described (diagram given) movable oven having progressive temp gradient is passed over adsorber tube (75 × 2 cm) containing silica gel. Test mixture was equimol 5-component hydrocarbon blend (ethane, propane, ethylene, propylene, α-butylene), desorbing gas was air. Difference in desorption time and temp of the gases was sufficient for effective separation. Air flow rate is critical. Optimum results obtained at air flow of 75 cc/min and oven displacement of 0·7 cm/min. V. B.

71. Determination of carbon monoxide in gases with ammoniacal copper (1) chloride solution. K. Buchner. *BrennstChemie*, 1953, **34** (11–12), 186–7.—The analysis of CO-rich gases is carried out in a stable Cu_2Cl_2 soln containing 10% NH_4Cl, which suffices to prevent Cu separation in storage. Advantages are high absorption capacity and final absorption val, which reaches a max in 6 passages. This enables the No. of Cu_2Cl_2 pipettes to be limited to 1, and prolongs the life of the β-naphthol soln used to absorb the residual CO. Traces of Cu deposited during the absorption suffice to reduce any cupric salts formed. Results of analyses are tabulated. R. T.

72. Asphalt analysis. R. N. Taxler and H. E. Schweyer. *Oil Gas J.*, 14.9.53, **52** (19), 158.—This issue of the Refiners' Notebook shows how to make a component analysis of asphalt into asphaltics, paraffinics, and cyclics. G. A. C.

73. Semi-micro distillation columns. M. Boivin. *Chim. anal.*, 1953, **35**, 182–7.—Detailed drawings and description of spinning band (5000 r.p.m.) column based on design of Lesesne and Lochte (*cf* Abs. 1161 of 1938).—With 50-cc flask column hold-up is 0·8 cc. Dist results given for benzene–toluene, benzene, toluene–*m*-xylene, and EtOH (99%)/MeOH (1%). V. B.

74. Patent. U.S.P. 2,624,782 (G.B. 17.8.49; 6.1.53). M. H. Lowson, assr to Anglo-Iranian Oil Co Ltd. Minute amounts of water in oil are detected and measured by forming a film of the oil between closely spaced parallel electrodes, applying an electrical potential and recording the current passing through the oil, which is maintained stationary until the current passing reaches a maximum. V. P. P.

GAS

75. Natural gas in the economy of North America. R. E. Davis. *Canad. Min. metall. Bull.*, July 1953, **45**, 421–8.—A brief review is given of natural gas reserves and developments in North America and of exploration and production in Mexico. The technology of long-distance gas transmission is discussed. The economics of long-distance transport of gas is described and discussed from the aspects of: line length; reserves and markets; load factor; gas storage; and financing. The Western Canada gas reserves are discussed, and past and present exploration in Western Canada is described and discussed. W. H. C.

76. Approximating natural gas composition. T. W. Legatski, J. W. Tooke, and L. A. Grundy. *Petrol. Refin.*, 1953, **32** (8), 105–8.—A chart, based on experimental results, is presented for the determination of the hydrocarbon composition of natural gas when the sp. gr. and adsorption index of the gas are known. The values determined are claimed to be accurate to about + or − 10% for individual components and + or − 5% for groups of components. R. D. S.

77. Patents. Ger.P. 876,837, 2.4.53. Biederbeck, Oberhausen-Holten, assr to Ruhrchemie A.G. Oberhausen-Holten. Process for continuous separation of CO_2 from gases, using lime briquettes in very tall layers.

Ger.P. 876,537, 2.4.53. Mewes, Erzingen, Münz, and Struck, Bochum-Dalhausen, assrs to Dr C. Otto & Comp. G.m.b.H. Bochum. Separation of tech gases by thermodiffusion.

BrennstChemie, 1953, **34** (9–10).

Ger.P. 877,746, 9.4.53. Rabe and Lohmeyer, assrs to BASF, Ludwigshafen (Rhein). Method for producing H_2.

BrennstChemie, 1953, **34** (11–12). R. T.

ENGINE FUELS

78. Volatility sets automobile performance. C. J. Domke, C. B. Tracy, and H. E. Taliaferro. *Petrol. Refin.*, 1953, **32** (7), 151–3.—The results of tests on 6 post-war cars to determine the effects of gasoline volatility on starting time, warm-up time, and vapour lock. Several gasoline blends were prepared, the important variables being R.V.P., % evaporated at 158° F, and the temp at which 50 and 90% were evaporated. R. D. S.

79. Residual fuel production and utilization. C. E. Habermann, R. E. Albright, and R. B. Killingsworth. *Mot. Ship*, Sept. 1953, **34** (402), 264.—Extracts from a paper given at the Internal Combustion Engine International Congress, Milan, are presented. The refining factors controlling the basic considerations underlying the production of residual fuels, resulting in wide variations in product characteristics, are outlined, and the effect of these characteristics on the utilization of residual fuel briefly discussed. U. M.

80. Patents. Ger.P. 876,987, 2.4.53. Pier, Heidelberg, and Donath, Pittsburg, Pa., assrs to BASF, Ludwigshafen (Rhein). Method for producing knockproof petrols.

Ger.P. 876,989, 2.4.53. Donath, Pittsburg, Pa., von Füner, Ludwigshafen (Rhein), and Peters, Wien, assrs to BASF, Ludwigshafen (Rhein). Method for producing knock-proof motor fuels from liq hydrocarbon oils.

Ger.P. 876,880, 2.4.53. Totzek and Daniels, Essen, assrs to Koppers G.m.b.H. Installation for producing combustible gases.

BrennstChemie, 1953, **34** (9–10). R. T.

GAS OIL AND FUEL OIL

81. Liquid fuels in America. E. Ayres. *Petrol. Refin.*, 1953, **32** (8), 90–4.—A discussion of the long range outlook for liq fuels from all sources. R. D. S.

82. Fuel oil reduction symposium. Anon. *Petrol. Refin.*, 1953, **32** (7), 97–109.—A review of residuum coking processes covering process developments, economics, and market possibilities for petroleum coke, and descriptions of 4 of the main coking processes, including flowsheets and some operating conditions. R. D. S.

83. A new use for used lubricating oil. F. Evans. *Petroleum, Lond.*, June 1953, **16** (6), 154–5.—Burner developed to use lub oil. Principle of the venturi is used to encourage a draught for the flame into the furnace space, the venturi burner being designed to give sufficient air supply without cooling too much the combustion area. By addition of water, well distributed throughout the oil in ratio 1 water to 3 oil, burning lub oil is atomized thoroughly, and combustion made so complete that there is no smoke. A honeycomb of firebricks is used to spread the flame and slow down its progress before reaching the flue. Principle of the burner is described.

No oils of lower flash-point should be used with the old lub oil, nor thicker axle and gear oils. G. H. G.

84. Carbon dioxide from fuel oil. Anon. *Petroleum, Lond.*, Sept. 1953, **16** (9), 265–6.—Process known as Kestnamine; plants currently manufactured have outputs of 200 or 100 lb/hr. The process is described. Good quality mineral fuel oil (preferably desulphurized) is burned with a minimum of excess air in the furnace of a lye heater, by means of a special proportioning oil burner capable of producing a flue gas approaching the theoretical CO_2 concn of 15% V/V. G. H. G.

85. Patents. U.S.P. 2,626,207 (17.9.48; 20.1.53). C. Wies, J. B. R. Caron, and E. B. Glendenning assrs to Shell Development Co. A fuel oil normally tending to cause screen clogging due to the presence of cracked components and entrained moisture containing a minor amount, sufficient to inhibit clogging, of a basic alkaline earth metal or aluminium hydrocarbon sulphonate.

U.S.P. 2,626,208 (19.12.49; 20.1.53). R. H. Brown, assr to Standard Oil Co, Chicago. Preparation of stable dist fuels from cracked stocks boiling 400°–750° F by washing with aq caustic alkali and then adding 0·01–0·001 wt % of a neutralized polybutene–phosphorus sulphide reaction product and 0·01–0·001 wt % of N : N′-disalicylidene-1 : 2-diaminopropane.

U.S.P. 2,626,882 (26.6.51; 27.1.53). R. H. Gerke, assr to United States Rubber Co. In a bullet-sealing fuel cell, the sealant layer comprises a zinc oxide-free vulcanizate of a rubbery copolymer of butadiene with styrene or *iso*prene or with *iso*prene and butyl acrylate having in uncured state a cohesive energy density of 56–72, 0·1–0·4% sulphur, 1–5% of an oxide of Mg, Ca, or Ba, 5–25% carbon black of average particle size <0·070 microns and 0·5–4% of a vulcanization accelerator, by wt based on wt of rubber. V. P. P.

LUBRICANTS

86. Selective refining of lubricating oils. F. Sef. *Nafta (Yugoslavia)*, 1953, **4** (7), 212–21.—Industrial processes of solvent refining of lub oils, including solvent characteristics, are reviewed on the basis of extensive bibliography. Special consideration is paid to the furfural process.

(Author's Abstract.)

87. Lubricants for engines and industrial equipment. C. B. Davies. *Petroleum, Lond.*, July 1953, **16** (7), 183.—A theoretical and practical treatment of lubricants in engines and industrial equipment is given. Developments have not really altered the fact that for a very large number of lubrication tasks, the performance of the lubricant will be determined merely by its visc. Use is made of a mineral lub oil as a heat-exchange medium; with additives they also withstand the severe operating conditions in a diesel engine. Metallic type additives are used to the greatest advantage in engines.

The problem of boundary lubrication is considered, metal soaps being specially mentioned in this respect. Attempts to measure the influence of different lubricants on the life of a bearing under severe conditions of load and speed have been made. Lubricants and additives are mentioned to cover varying conditions. G. H. G.

88. Synthetic gas turbine lubricants. Anon. *Petroleum, Lond.*, July 1953, **16** (7), 189.—Lowest temp at which lubricant must work is preferably −60° C. Lubrication has to be provided for: (1) bearings; (2) reduction gear trains; (3) various aircraft accessories; (4) servo-mechanisms. As a turbine oil cannot be diluted with fuel to facilitate cold starting, it must be of sufficiently low visc at minimum operating temp to allow the oil pressure to be built up. Lubricant must have low volatility to prevent excessive evaporation. The lubricants are built up by synthesis to fulfil the necessary requirements: low visc change with temp, high fl. pt. and low volatility, excellent lubricating properties, and stability. G. H. G.

89. Valve lubrication: a simplification. Anon. *Petroleum, Lond.*, June 1953, **16** (6), 161.—A single lubricant has been formulated which is highly efficient on wide ranges of services at high and low temp for valves in chemical and petroleum plants handling a diversity of line fluids. This lubricant is soft at room temp; visc varies little over temp range 0°–620° F, and does not carbonize at temp of 620° F or more. Can be used in plants handling sulphuric acid, brine, hydrocarbons, etc. G. H. G.

90. Contribution to the study of lubricating oils by extreme pressure using Four Ball Testing Machine. A. Girelli, C. Paleari, and C. Siniramed. *Riv. Combust.*, 1953, **7** (7–8), 481–98.—Practical significance of results obtained by testing lubricating oils in the Precision Shell Four Ball Testing Machine is examined. The Mean Hertz Load test method is particularly considered, and an accelerated procedure for the Mean Hertz Load determination is proposed. Results of experiments carried out on several different commercial oils (rear axle and gear box lubricants, and cutting fluids) are reported, and the applicability of the Four Ball Testing Machine in different cases is discussed. (Authors' Summary.)

91. Analysis and utilization of extract from selective refining of lubricants. S. Gibinski. *Bull. Polish Inst. Petrol.*, 1952, **2**, 12 (Suppl. to *Nafta* (*Krakow*), 1952, **8**).—Extract came from refining with 150 and 300% of furfural and same quantities of 1 : 1 phenol and water in 1, 2, and 3 passes. Markusson's analytical method showed that extract contained resins, acids, anhydrides, and asphaltenes, the last 3 in quantities identical in all extracts. Chromatographic analysis using petroleum ether showed that whilst resins contained N, O, and I, oils extracted had little of these elements. They also had high V.I. It is therefore concluded that poor qualities of some lubricants are due to resins.

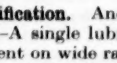
Utilization of the extract appears to lead through destructive dist or to preparation of cable oil which has very good properties, and its yield is *ca* 50%. 40% extract and 60% linseed oil formed a good linseed oil substitute for varnish manufacture. M. S.

92. Testing lubricating engine oils in tractors. M. Mitrasinovic and G. Guljas. *Nafta* (*Yugoslavia*), **4** (7), 221–7.—A number of field tests with tractors shows that domestic lubricating engine oils now in commercial use could stand a test period of 80–100 working hr before any deterioration of the oil was observed. With tractors which were in an undue mechanical state, no improvement was brought about when more viscous oils were used, as the useful time of an oil in such an engine was only dependent upon the extent of the mechanical incorrectness of the engine. (Authors' Abstract.)

93. Patents. U.S.P. 2,637,693 (16.4.49; 5.5.53). J. L. Baggett and M. W. Duke, assrs to Celanese Corpn. Yarn lubricant comprising mineral oil, tricresyl phosphate, oleic acid, triethanolamine, oleyl alcohol, and a desalted and dehydrated sodium hydroxide neutralized reaction product of oleum with a mixture of oleic acid, peanut oil, mineral oil, and diamylphenol.

U.S.P. 2,637,694 (13.4.51; 5.5.53). W. H. Peterson and T. Skei, assrs to Shell Development Co. Grease comprising a lub oil, a soap of a higher hydroxy fatty acid, and magnesium hydroxide.

U.S.P. 2,637,695 (2.4.51; 5.5.53). J. K. McKinley, W. H. Goff, and R. F. Nelson, assrs to Texas Co. Grease comprising a mineral lub oil and a mixed calcium–sodium soap of oxidized pet wax.

U.S.P. 2,637,696 (25.11.50; 5.5.53). A. D. Kirshenbaum and J. M. Boyle, assrs to Standard Oil Development Co. Hydrocarbon oil containing 0·01–5% wt of a compound of the formula R–  –(O.CHR^{I}.CHR^{II}–)$_n$S.CS.NR^{III}R^{IV}, where R represents an aliphatic side-chain, R^{I} and R^{II} represent hydrogen or an alkyl group, R^{III} and R^{IV} represent hydrogen or aliphatic or cycloaliphatic hydrocarbon groups, and n is 1, 2, or 3.

U.S.P. 2,637,697 (30.12.48; 5.5.53). J. H. Bartlett, assr to Standard Oil Development Co. Mineral lub oil containing a polymerized ester of sorbic acid.

U.S.P. 2,637,698 (30.12.48; 5.5.53). T. S. Tutwiler, assr to Standard Oil Development Co. V.I. improvers for lub oils are copolymers of an alkyl ester of itaconic acid and an alkyl ester of acrylic or methacrylic acid.

U.S.P. 2,637,722 (31.5.50; 5.5.53). D. Frazier, assr to Standard Oil Co. Lubricants and additives therefore are made by reacting 5–60% wt phosphorus sulphide and 95–40% wt of a mixture of an organic compound containing a hydroxy, carbonyl, ether, or carboxy group and having a b.p. $<$225° F with a polyolefin, at 225°–500° F, and treating the product with 0·1–0·75% wt of an alkali hydroxide and then with 0·15–0·5 wt of a hydrogen peroxide compound.

U.S.P. 2,640,053 (23.11.49; 26.5.53). M. W. Hill and R. H. Jones, assrs to Standard Oil Development Co. Additives for lub oils made by reacting 1 mol of a phosphorus sulphide with 2–5 mol of a hydrocarbon and reacting the product with 0·1–50% of its wt of an olefin. J. M. S.

BITUMEN, ASPHALT, AND TAR

94. Patents. U.S.P. 2,625,512 (29.4.48; 13.1.53). E. R. Powell, assr to Johns-Manville Corpn. Process for making loose fill insulation material by flash heat expanding finely divided perlite while dispersed in hot gas suspension, partially cooling the suspension, and mixing it with a fog dispersion of a high m.p. bituminous binder to form fine films of binder on the perlite particles, and agitating and further cooling to agglomerate the particles and solidify the binder films.

U.S.P. 2,626,864 (31.12.47; 27.1.53). J. Miscall and C. E. Rahr, assrs to Great Lakes Carbon Corpn. Building board comprising 90–25 wt % of fibres of length $>$20 mm and 10–75 wt % of asphalt-coated cellular expanded perlite in the form of discrete particles, the perlite being $<$20 mesh size, of bulk density 1–20 lb/cu. ft. and being coated with 1–150 lb asphalt (m.p. 100°–250° F) per cu. ft., the average length of the fibres being substantially $>$ average dia of perlite particles.

U.S.P. 2,626,872 (2.6.48; 27.1.53). J. Miscall, assr to Great Lakes Carbon Corpn. A building board consisting of 35–57 wt % granular expanded perlite and 65–43 wt % of asphalt (m.p. 100°–250° F), the board having a density of 25–60 lb/cu. ft.

U.S.P. 2,626,875 (24.5.44; 27.1.53). K. H. McConnaughay. Preparation of bituminous paving composition by coating aggregate with a bituminous emulsion, separating the mixture into discrete particles and passing the particles through an atm at *ca* 1000° F. V. P. P.

SPECIAL HYDROCARBON PRODUCTS

95. Patents. U.S.P. 2,630,381 (21.11.50; 3.3.53). A. H. Schlesinger and M. Kosmin, assrs to Monsanto Chemical Co. 2-mercaptobenzoxazole and its chloro-, nitro-, and alkyl-derivatives are herbicides.

U.S.P. 2,630,409 (6.10.49; 3.3.53). W. M. Bruner and J. C. Lehr, assrs to E. I. du Pont de Nemours and Co. Paint and varnish remover comprising 100 parts 1 : 1 : 2-trimethoxyethane and 10–100 parts of a volatile liq diluent which is an aromatic hydrocarbon, an alkane, or a chloroalkane.

U.S.P. 2,631,935 (4.3.50; 17.3.53). L. L. Baumgartner, assr to B. F. Goodrich Co. Esters of thiolacetic acid with monohydric phenols are herbicides.

U.S.P. 2,631,962 (17.11.48; 17.3.53). J. B. Moore, assr to McLaughlin Gormley King Co. Water miscible spray insecticidal composition comprising an alkylene glycol and tetraethylpyrophosphate or diethyl-*p*-nitrophenylthiophosphate.

U.S.P. 2,632,698 (6.4.50; 24.3.53). W. D. Stewart, assr to B. F. Goodrich Co. Plant growth regulant compositions containing haloaryl sulphinic and thiosulphinic acids or their salts.

U.S.P. 2,633,418 (15.7.50; 31.3.53). L. B. Scott, R. R. Whetstone, J. van Overbeek, and R. Blondeau, assrs to Shell Development Co. Herbicidal composition comprising a hydrocarbon oil containing 10–50% aromatics and boiling between 275° and 550° F, and a cycloaliphatic carboxylic acid having a water sol at 20° C of $<0{\cdot}0003$ g/100 g of water. J. M. S.

Ger.P. 877,140, 9.4.53. Weiss, assr to BASF, Ludwigshafen (Rhein). Method for producing H.COOH. (Addn to Pat. 696,868.)

Ger.P. 877,449, 9.4.53. A.G. für Unternehmungen der Eisen- und Stahlindustrie, Essen. Process for halogenation of hydrocarbon mixtures.

Ger.P. 877,299, 9.4.53. Damm, Ratingen. Process and installation for obtaining H.CHO by direct oxidn of CH_4.
BrennstChemie, 1953, **34** (11–12). R. T.

DERIVED CHEMICAL PRODUCTS

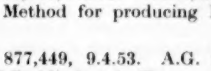
98. Petroleum chemicals reviewed. R. F. Goldstein. *Petrol. Times*, 18.9.53, **57** (1464), 920.—This is a review of the position regarding petroleum chemicals in the U.K. only.

Production capacities from 1948 are tabled, the future of petroleum chemicals discussed together with aspects of polyethylene ethylene crude, outlets for C_4 hydrocarbons, phenol, and detergents. G. A. C.

97. Uses of oxygen in the petrochemical industry. Pt II. Commercially used reactions. P. W. Sherwood. *Petrol. Refin.*, 1953, **32** (7), 141–4.—The concluding part of the series covers the manufacture of acetylene and ethylene from methane and ethane respectively by partial combustion processes giving process problems and typical yields. A discussion of the use of oxygen in the partial oxidn of ammonia and in the production of sulphuric acid is also given. R. D. S.

98. Where is Canada going in petrochemicals? E. F. Gibbons, *Petrol. Refin.*, 1953, **32** (7), 89–91.—A consideration of the potential markets for various products of the Canadian petrochemical industry which is based on the natural gas fields of Alberta. R. D. S.

99. Patents. U.S.P. 2,636,020 (G.B. 10.2.48; 21.4.53). H. Zenftman and R. McGillivray, assrs to I.C.I. Ltd. An artificial resinous material in which the repeating unit consists of



R″ is the radical of HO–R″–OH where HO–R″–OH is a dihydroxy aromatic compound free of reactive substituents in which the hydroxyl groups are attached directly to the aromatic nucleus and are attached to non-adjacent carbon atoms.

U.S.P. 2,636,021 (25.5.49; 21.4.53). R. B. Thompson, assr to Universal Oil Products Co. A resinous condensation product of approx equimolecular proportions of dibenzalacetone and hydrogen sulphide.

U.S.P. 2,636,023 (7.9.49; 21.4.54). P. J. Culhane and G. M. Rothrock, assrs to E. I. du Pont de Nemours and Co. An acetone-soluble copolymer of vinyl chloride, acrylonitrile, and vinyl pyridine containing 45–80% by wt of vinyl chloride, 10–45% of acrylonitrile, and 2–10% of a vinyl pyridine. D. A. R.

Ger.P. 877,601, 9.4.53. Ströbele, assr to BASF, Ludwigshafen (Rhein). Method for producing semiethers of 1 : 3-glycols.

Ger.P. 877,602, 9.4.53. Wenzel, assr to BASF, Ludwigshafen (Rhein). Method for producing org O_2-compounds.

Ger.P. 877,598, 9.4.53. Vorbach, Wietzel, and Scheuermann, assrs to BASF, Ludwigshafen (Rhein). Method for producing alcohols.

Ger.P. 877,754, 9.4.53. Reppe and Pasedach, assrs to BASF, Ludwigshafen (Rhein). Method for producing butane diol-(1 : 2).

Ger.P. 877,300, 9.4.53. Schuster and Eilbracht, assrs to Chemische Verwertungs Gesellschaft Oberhausen m.b.H. Oberhausen-Holten. Method for producing org compounds containing O_2.

Ger.P. 877,452, 9.4.53. Bähr, Corr, and Waldmann, assrs to BASF, Ludwigshafen (Rhein). Method for producing olefins.

Ger.P. 877,453, 9.4.53. Franke and Weissbach, assrs to Chemische Werke Hüls G.m.b.H., Marl (Kr. Recklinghausen). Method for producing alcohols of the diacetylene series.

Ger.P. 877,302, 9.4.53. Kurtz, Bretschneider, and Möller assrs to Farbenfabriken Bayer, Leverkusen-Bayerwerke. Method for producing acrylic acid nitrile from C_2H_2 and HCN. (Addn to Pat. 728,767.)
BrennstChemie, 1953, **34** (11–12). R. T.

COAL, SHALE, AND PEAT

100. Investigation of the nature of " asphaltenes " from humic tars. E. I. Kazakov and K. V. Grigoryva. *Zhur. Priklad. Khim.*, 1953, **26**, 96–100.—Substances insol in petroleum ether (30°–65° C) and sol in C_6H_6 were yielded (13–19%) by low temp tars from peat and coal. Tars were preliminarily dewaxed with acetone. " Asphaltenes " can be divided into basic (11–15%), phenolic (53–60%), and neutral (25–30%) components; analyses given. Their mol. wt. (280–370) is much less than that of asphaltenes from petroleum (*ca* 3000). Tar " asphaltenes " have high content of N_2 (1·7–2·7%) and O_2 (13–14·7%). V. B.

101. Patents. Ger.P. 877,443, 9.4.53. Winnacker, Geisler, and Strohfeldt, assrs to Knapsack-Griesheim A.G. Method for producing ash-free lignite coke.

Ger.P. 877,593, 9.4.53. Broche and Hoffmann, assrs to Gewerkschaft Mathias Stinnes, Essen. Binder for coal briquetting.
BrennstChemie, 1953, **34** (11–12). R. T.

MISCELLANEOUS PRODUCTS

102. Heat radiation suppression. Anon. *Auto. Engr*, Aug. 1953, **43** (569), 323.—The article is a summary of a report, entitled " Radiation Suppressing Coatings for Metals at Elevated Temperatures," published by the Fulmer Research

Institute. The report deals with the effectiveness, strength, and methods of bonding refractory materials to metals.
T. T.

103. Oil resistance of nitrile rubber. N. G. Duke and W. A. Mitchell. *India Rubb World*, 1953, **128** (4), 485–91.—The paper is limited to a discussion of the properties of copolymers of butadiene and acrylonitrile, rather than to nitrile rubbers in general, which are defined as copolymers of a diene and an unsaturated nitrile. Oil resistance is their most important property, and is the reason for their extensive use, although they are more costly than other types. Data and charts are presented showing the effects of various factors on the oil resistance of nitrile rubbers. Vol change after immersion in test oils and fuels is used as a measure of oil resistance. It is concluded that the oil resistance of a nitrile rubber compound depends primarily on its acrylonitrile content. This general relation holds true for blends of nitrile rubbers with different acrylonitrile contents and blends of nitrile rubber with polybutadiene. The chemical nature of the oil or fuel is also of primary importance. C. N. T.

104. Autoxidative reactions : their chemistry, mechanism, and catalysis by metal salts. C. E. H. Bawn. *J. Oil Col. Chem. Ass.*, Aug. 1953, **36** (398), 443.—This article is confined in the main to the autoxidation of organic molecules, particularly to aldehydes and saturated and unsaturated hydrocarbons. Much evidence has accumulated which shows that reactions between gaseous oxygen and these compounds are free radical in nature. The primary product of the oxidn of an organic molecule is the hydroperoxide in the case of the hydrocarbons and the corresponding peracid with the aldehydes. The general kinetics of autoxidation reactions are discussed. Evidence presented shows the influence of structure on the rate of oxidn.

Salts of heavy metals catalyse many reactions in which molecular oxygen is involved, *e.g.*, the autoxidation of saturated and unsaturated hydrocarbons, aliphatic and aromatic aldehydes; degradation of high polymers, and the drying of oils. In the case of aldehydes it was observed that the onset of oxygen absorption corresponded with a change of valency state of the metal. Peroxidic bodies are the ones which effect valency changes.

Like other chain reactions, oxidative processes are very susceptible to inhibition. Certain compounds in small quantities inhibit oxidn for long and well-defined periods, after which the reaction follows the normal course.

Although the initial product of autoxidation of aldehydes and hydrocarbons is a peroxide, as the reaction proceeds other oxygenated products are formed, *e.g.*, alcohols, aldehydes, ketones, and acids, with water and carbon dioxide. Evidence suggests these products arise by decomposition and thermal reactions of the hydroperoxides.

The effect of oxygen on polymers and polymerization processes is discussed. Oxygen facilitates branching and cross linking by promoting free radical formation. 43 literature refs. D. K.

105. Patents. U.S.P. 2,626,283 (28.8.50; 20.1.53). R. R. Whetstone, assr to Shell Development Co. Production of acrolein acetals by reacting acrolein with an alcohol in the presence of a porous, solid, calcined silica–alumina hydrogel having a surface area of $\leqslant 100$ m²/g.

U.S.P. 2,626,957 (1.9.48; 27.1.53). B. A. Orkin, assr to Socony-Vacuum Oil Co Inc. Compound of formula $(RT)_3SiOSi(TR)_3$, wherein R = alkyl, cycloalkyl, aryl, aralkyl, or thienyl, 2-ethyl- or 5-methyl-thienyl, pyridyl, quinolyl, or furfuryl radical, T = oxygen or sulphur, the total number of carbon atoms and heterocyclic atoms being 42–60.

U.S.P. 2,626,266–7 (*(a)* G.B. 4.12.47; *(b)* G.B. 13.1.48; 20.1.53). A. J. Barry, assr to Dow Corning Corpn. Preparation of arylhalosilanes by reacting a benzenoid hydrocarbon free from unsaturated aliphatic side chains with: *(a)* trichlorosilane at $>230°$ C in presence of a boron halide; *(b)* a silane of formula R_nHSiCl_{3-n}, wherein R is a monovalent hydrocarbon radical free from aliphatic unsaturation, $n =$ 0 or 1, at $>250°$ C in presence of $AlCl_3$, the reaction mixtures being at least partly in liq phase.

U.S.P. 2,626,268 (G.B. 11.12.48; 20.1.53). A. J. Barry, L. De Pree, and D. E. Hook, assrs to Dow Chemical Co. Preparation of aliphatic silanes by reacting an olefin at $<410°$ C with a silane having both H and halogen atoms and $\leqslant 1$ monovalent hydrocarbon radical, free of aliphatic unsaturation, attached to silicon.

U.S.P. 2,626,269 (23.2.49; 20.1.53). A. J. Barry, assr to Dow Corning Corpn. An aromatic chlorohydrocarbon containing nuclearly substituted chlorine is reacted with trichlorosilane in presence of boron or aluminium chloride at 235°–360° C, at least partly in liq phase, to produce arylhalosilanes.

U.S.P. 2,626,270 (Canada 1.2.49; 20.1.53). L. H. Sommer, assr to Dow Corning Corpn. Compounds of the formula $t\text{-}(C_4H_9)RSiX_2$, wherein R = alkyl or phenyl radical and X = OH or NH_2.

U.S.P. 2,626,271 (6.6.46; 20.1.53). A. J. Barry, D. E. Hook, and L. De Pree, assrs to Dow Chemical Co. Production of organohalosilanes by reacting a polyolefin with trichlorsilane at $\leqslant 200$ p.s.i. and $<385°$ C in absence of olefin polymerization and Friedel–Crafts cat.

U.S.P. 2,626,272 (26.7.50; 20.1.53). J. L. Speier, assr to Dow Corning Corpn. Compounds of formula $R_3SiO(CH_2)_xCl$, wherein R = alkyl or phenyl, $x = 3$, 4, or 5.

U.S.P. 2,626,273 (5.11.47; 20.1.53). M. J. Hunter and P. C. Servais, assrs to Dow Chemical Co. Preparation of alkoxy hydrosilanes by reacting a silane ester of formula $R_{4-n}Si(OR')_n$, wherein R = alkyl or aryl, R′ = alkyl, $n =$ 1, 2, 3, or 4, in liq phase in presence of free acid with a silane having bonded to the Si atom, one H atom, $\leqslant 1$ chloro atom, and any remaining bonds by alkyl or aryl radicals, whereby interchange is effected between $\leqslant 1$ alkoxy radical of the ester and a chlorine atom of the silane.

U.S.P. 2,624,752 (12.9.49; 6.1.53). R. C. Morris, J. L. Van Winkle, and De L. E. Winkler, assrs to Shell Development Co. Esters of polyhydric alcohols and *p-tert*-alkylbenzoic acids, *e.g.*, 1 : 5-pentanediol bis-*p-tert*-butyl benzoate.

U.S.P. 2,624,753 (30.6.48; 6.1.53). W. S. Emerson and R. I. Longley, assrs to Monsanto Chemical Co. 5-*n*-Butoxy-1-hexyladipate-plasticizer, especially for P.V.C.

U.S.P. 2,624,754 (4.2.40; 6.1.53). E. S. Blake, assr to Monsanto Chemical Co. An ester of the structure

$$RO.CO.C_3H_x.CO.O.R'.O.CO.C_3H_x.CO.OR$$

wherein R = unsaturated C_{18-22} alkyl radical; $x = 2$ or 4; R′ = C_2H_4 or $C_2H_4OC_2H_4$, for use in turbine oils to impart rust-inhibiting properties and as plasticizers.

U.S.P. 2,625,570 (26.8.50; 13.1.53). H. Pines and J. A. Vesely, assrs to Universal Oil Products Co. A polyhydric phenol or its ether is converted into a compound containing less oxygen by reaction with a hydrogen donor (water, an alcohol, or naphthene) in presence of an acid acting hydrogen-transfer cat.

U.S.P. 2,625,571 (21.6.51; 13.1.53). H. Pines and V. N. Ipatieff, assrs to Universal Oil Products Co. 1-(4-Alkylphenyl)-1-(2-alkyl-5-*cyclo*alkalkyl)-phenyl-2-*cyclo*alkyl-1-alkene, in which the alkene group contains $\leqslant 3$ C atoms, may be reacted with chlorine to produce insecticides, with aldehydes (HCHO) to produce resins.

U.S.P. 2,626,253 (24.11.48; 20.1.53). J. R. Ingram, assr to Monsanto Chemical Co. A resinous anti-oxidant is prepared by heating in presence of 1 mol of a Friedel–Crafts cat, 1 mol of a 1 : 2-dihydroquinoline containing only C, H, and one N atom, and 1 mol of an aralkyl chloride, indanyl chloride, or an aromatic substituted C_{8-12} olefin with $\geqslant 2$ $CH_2 = CH$– groups.

U.S.P. 2,624,690 (U.K. 19.2.43; 6.1.53). S. A. Leader, assr to Portland Plastics Ltd. Liq or pasty composition for application to the skin or a wound surface to form a waterproof germicidal film thereon comprising polymerized methyl

methacrylate *A*, a volatile solvent (acetone, M.E.K., chloroform, methylene chloride, or ethyl chloride) and 30 to 120 parts by wt of methyl or phenyl salicylate per 100 parts of *A*.

U.S.P. 2,625,523 (17.7.45; 13.1.53). J. D. Garber and W. J. Sparks, assrs to Standard Oil Development Co. Surface coating composition comprising a heat-bodied solid, hydrocarbon-sol, hard, low elongation polymer of butadiene with a minor proportion of *iso*-octene prepared by the action of a Friedel–Crafts cat at between +10° C and −40° C, the polymer having been heat-bodied at 200°–350° C in combination with linseed oil.

U.S.P. 2,624,717 (27.8.49; 6.1.53). E. M. Geisir, assr to Universal Oil Products Co. Production of drying oils by cobodying at 150°–450°C an unsaturated fatty acid glyceride ester and a mixture of conjunct polymers consisting essentially of polyolefinic cyclic hydrocarbons of mol. wt. 250–450, containing 2–4 double bonds per mol, *ca* 70% of which are conjugated, adding a polymerization cat and polymerizing at 0°–300° C.

U.S.P. 2,624,715 (24.10.50; 6.1.53). M. F. Wildish, assr to Monsanto Chemical Co. Adhesive composition comprising (*a*) a heteropolymer obtained by polymerizing a mixture of monovinyl compounds free from other reactive groups with an equimolar amount of a C_{4-6} monoethylenic unsaturated dicarboxylic acid and 0·02–1 wt % divinylbenzene as cross linking agent, the heteropolymer being reacted per mol with 0·8 to 2·25 mol of alkali metal or ammonium hydroxide or a monamine of dissociation constant $>10^{-6}$ and (*b*) 25–70 wt % of a water soluble carbohydrate, based on solids content.

U.S.P. 2,625,526 (23.7.47; 13.1.53). W. J. Sparks and D. W. Young, assrs to Standard Oil Development Co. Composition comprising, by wt, 10–100 parts of a synthetic rubber made from butadiene and 15–45 wt % acrylonitrile, 100 parts P.V.C. and 20–50 parts of a linear polyester condensation product of a dimerized linoleic acid and ethylene glycol of mol. wt. $\leqslant 2000$.

U.S.P. 2,624,722 (15.2.49; 6.1.53). E. L. Kropa and A. S. Nyquist, assrs to American Cyanamid Co. Copolymers of acrylonitrile with 15–30 wt % of allyl or methallyl alcohol are particularly suitable for production of synthetic fibres.

U.S.P. 2,626,946 (12.12.50; 27.1.53). J. A. Price, W. M. Thomas, and J. J. Padbury, assrs to American Cyanamid Co. Copolymer of acrylonitrile *A* in major proportion, monoalkylamine *B* (1·5–15 wt % of $A + B$) and a $C_{>4}$ alkyl acrylate.

U.S.P. 2,626,944 (9.12.49; 27.1.53). H. W. Coover and J. B. Dickey, assrs to Eastman Kodak Co. A polymer of an α-acylamidoacrylic acid of formula

$$CH_2 = \underset{\displaystyle NH.CO.R}{\overset{\displaystyle |}{C}}.COOH$$

wherein R = C_{1-4} alkyl.

U.S.P. 2,624,682 (24.1.51; 6.1.53). J. E. Hazeltine, assr to Armstrong Cork Co. Making floor or wall coverings by seal coating a sheet of saturated felt with a tackifier (polychloroprene or a copolymer of styrene-butadiene, acrylonitrile–butadiene, or *iso*butylene–*iso*prene) and a reinforcing agent (polyvinyl chloride, a copolymer of vinyl chloride–vinylidene chloride or styrene–butadiene or polystyrene), block printing on to the seal coat with a decorative composition containing a dispersion of vinyl resin *A* having a V.I. $\leqslant 1{\cdot}67$ when $\geqslant 5\%$ volatile material is present whereby sharply defined patterns are produced, and heating the coated product until *A* is fused.

U.S.P. 2,624,683 (24.1.51; 6.1.53). I. I. Bezman, assr to Armstrong Cork Co. Floor covering comprising a saturated felt backing, a first coating obtained by depositing from an aq polyvinyl chloride dispersion, and a fused topcoat deposited from an aq dispersion containing 50–65% polyvinyl chloride and 35–50% butadiene–acrylonitrile rubber.

U.S.P. 2,626,223 (17.10.51; 20.1.53). F. A. Sattler, J. Swiss, and J. G. Ford, assrs to Westinghouse Electric Corpn. Resinous electrical insulation comprising the copolymer of (A) 95–60 parts by wt of the polyester-amide of (*a*) 3–4·5 mol of an ethylenically unsaturated dicarboxylic acid, (*b*) 0·5–2·0 mol of an aliphatic dicarboxylic acid or anhydride having no ethylenic unsaturation, $\leqslant 2$ non-carboxyl carbon atoms and no other reactive groups, (*c*) 1·5–4·7 mol of monoethanolamine and/or mono*iso*propanolamine, (*d*) up to 0·6 mol of a primary diamine (ethylene diamine, propylene diamine, or urea), the sum of the mol of (*c*) and (*d*) being 2·2–4·7, and (*e*) 1–2·4 mol of $\leqslant 1$ polyhydric alcohol, $\geqslant 75$ mol % having >3 hydroxyl groups, the proportions of (*a*), (*b*), (*c*), (*d*), and (*e*) being such that the number of carboxyl groups form $\geqslant 10\%$ stoichiometric excess over total number of hydroxyl and amino groups, and vice versa, the reactants having been heated together at $\leqslant 100°C$ until a resin of R and B m.p. $\geqslant 90°$ C is produced and (B) 5–40 parts by wt of a resinous epoxide of R and B m.p. 40°–140° C, which is the polyether derivative of a polyhydric alcohol, contains an average of >1 epoxide group per mol and is free from functional groups other than epoxy and hydroxyl groups, the copolymer having been produced by heating (A) and (B) together until a 70% soln of the product in cresol has a R and B m.p. of 27°–55° C.

U.S.P. 2,626,250 (13.5.50; 20.1.53). J. C. Petropoulos and L. E. Cadwell, assrs to American Cyanamid Co. Coating composition prepared by reacting in an inert org solvent b.p. $\leqslant 100°$ C, forming 20–60 wt % of total reaction mixture, an oil-modified alkyd resin *A* with 30–50 wt % of a monomeric vinyl compound consisting of 3–17·5 wt % (both based on total wt of final reaction product) of diallyl fumarate or maleate. *A* is the reaction product of 15–45 wt %, based on *A* of a saturated polycarboxylic acid or phthalic acid, a polyhydric alcohol and 30–65 wt %, based on *A*, of a non-conjugated glyceride oil of iodine No. 120–190.

U.S.P. 2,626,870 (5.12.49; 27.1.53). H. H. Cooke and D. Russo, assrs to Standard Oil Development Co. Auto polishing composition consisting essentially of 0·001–5 wt % of a straight chain polydimethyl siloxane of visc >500 cs at 25° C, 1–5 wt % wax, 5–15 wt % abrasive, 0·2–4 wt % emulsifier of the bodying type, 3–25 wt % of a hydrocarbon solvent for the wax, and <1 wt % of a water-sol synthetic non-ionic or anionic wetting agent.

U.S.P. 2,625,568 (27.3.51; 13.1.53). D. W. Young, D. L. Cottle, and W. F. Fischer, assrs to Standard Oil Development Co. Ketone condensation products of bisphenyl type compounds. V. P. P.

CORROSION

106. Corrosion of steels by kerosine and the combating thereof. I. N. Putilova *et al.* *Zhur. Priklad. Khim.*, 1953, **26**, 148–54.—Plates (60 × 20 × 2 mm) of 5 low-alloy steels were immersed (room temp, diffuse daylight, O_2 not excluded) in kerosine (b.p. 147–279, neut. val. 0·005, I.V. 0·3, S 0·05%) and time to visible corrosion noted. W-containing (1·5%) steel was most resistant. Corrosion is due to oxidn of kerosine on metal surface with formation of acids; 90% of corrosion product is Fe''' salt of org acids. Kerosine dried and purified by standing over Na causes negligible corrosion. Na benzoate does not significantly decrease corrosion in kerosine phase, although inhibiting corrosion in water phase if free water is present. Certain organic substances (not specified) containing Cl, S, NH_2, and OH groups when added to kerosine inhibit corrosivity of latter. V. B.

107. Casebook of a corrosion chemist. M. Brooke. *Petrol. Refin.*, 1953, **32** (8), 131–2.—Brief reports of 5 corrosion problems which arose in plant operation and of the remedies adopted. R. D. S.

108. Estimating the corrosivity of crude oils. H. A. Cataldi, R. J. Askevold, and A. E. Harnsberger. *Petrol. Refin.*, 1953, **32** (7), 145–50. The report of an API sub-committee presenting 2 methods of comparing the probable corrosivity

of an unknown crude with that of a known and used crude at temp above 600° F. One method is based on the change in electrical resistance of a specimen due to corrosion and the other on vol of hydrogen sulphide given off by the crude at different temp levels. The results obtained from comparisons of 22 American crudes are listed. R. D. S.

109. Stainless steels. Anon. *Chem. Engng*, 1953, **60** (4), 290–300. **18-8 Stainless steels.** Anon. *Chem. Engng*, 1953, **60** (5), 300–12.—The corrosion resistance of these important materials of construction to a number of corrosives, with physical and mechanical properties. D. M.

110. Patents. U.S.P. 2,630,368 (1.6.46; 3.3.53). A. Wachter and N. Stillman, assrs to Shell Development Co. Corrosion of ferrous metals is inhibited by the vapour of a nitrite salt of an N-heterocyclic organic base.

U.S.P. 2,631,950 (27.9.49; 17.3.53.) M. Rosenfield and C. F. Pickett. Composition for removing rust and scale comprising oxalic acid and iron or aluminium chloride.

U.S.P. 2,631,951 (30.11.50; 17.3.53). A. E. Chester, assr to Poor and Co. Zinc is protected against corrosion by treatment with an aq soln of chromic acid, ammonium persulphate, and trifluoroacetic acid.

U.S.P. 2,631,979 (30.8.50; 17.3.53). J. P. McDermott, assr to Standard Oil Development Co. Rust-inhibiting composition comprising a mineral lub oil and 0·1–2% of dimerized linoleic acid.

U.S.P. 2,632,694 (14.11.50; 24.3.53). F. M. Watkins, assr to Sinclair Refining Co. Anti-corrosive properties are imparted to light pet dist by adding an ammonium mahogany sulphonate and an acyloxycarboxylic acid, an esterified α-hydroxy aliphatic carboxylic acid, or a fatty acid prepared by oxidn of microcrystalline wax.

U.S.P. 2,632,695 (20.9.51; 24.3.53). P. S. Landis and E. B. Backensto, assrs to Socony-Vacuum Oil Co. Light pet products are prevented from rusting ferrous surfaces by adding a dimer or trimer of an unsaturated aliphatic monocarboxylic acid or of a hydroxyaliphatic monocarboxylic acid.

U.S.P. 2,632,709 (19.7.49; 24.3.53). K. F. Schiermeier and P. W. Jones, assrs to Shell Development Co. Rust-inhibiting composition comprising oxidized wax, a higher aliphatic carboxylic acid, and a light liq pet fraction. J. M. S.

ENGINES AND AUTOMOTIVE EQUIPMENT

111. Bearing failures—diagnosis and prevention. H. W. Luetkemeyer. *Petrol. Refin.*, 1953, **32** (7), 135–7.—Discusses the causes and prevention of the main types of bearing failure which are given as fatigue, wiping and seizure, corrosion, erosion, and wear. R. D. S.

112. Liner wear in marine diesel engines of medium and large cylinder bore with particular reference to use of heavy fuel oil. G. Simonetti. *Riv. Combust.*, 1953, **7** (7–8), 453–80.—After giving the description of the graphic method for measure of liner wear on diesel engines of medium and large cyl bore, the paper presents a discussion on kind, latitude, and causes that give rise to wearings, with special reference to influence of fuel characteristics and quality of cast iron of the liners. The paper presents in detail the method for wearing tests on liner and piston ring materials as it has been designed and realized by Fiat Grandi Motori Laboratories. (Author's Summary.)

113. Commercial vehicle gearboxes. J. T. Riley. *Auto. Engr*, Aug. 1953, **43** (569), 345.—David Brown gearboxes, Models 557, 542, and 437 are illustrated and described. Future trends of design are discussed, and the author predicts increasing demands for synchromesh gearboxes and increased number of speeds. Manufacturing operations are described. Precautions to be taken to avoid major troubles liable to occur in service are recommended. T. T.

114. Gas turbine arrangements. A review of systems for automobiles. F. R. Bell. *Auto. Engr*, Aug. 1953, **43** (569), 325.—The advantages of free power turbine systems over single-shaft systems are assessed, and the engine chosen for installation in a car is described. The set consists of a single-stage centrifugal compressor driven by a single-stage axial flow turbine, with a single-stage power turbine using exhaust from the compressor turbine. A heat exchanger is included. Alternative engine arrangements are considered and compared with the chosen arrangement, in order to justify its selection. Items discussed include: axial compressors, radial flow turbines, turbine blade cooling, variable nozzles, multi-stage engines, closed cycles, and mixed cycles. T. T.

115. Doxford accumulator injection system. Anon. *Mot. Ship*, Sept. 1953, **34** (402), 232.—New fuel arrangements have been installed in the 3300-b.h.p. standard 4-cyl engine in the M.T. *British Craftsman*; the common-rail fuel pump was removed and the front camshaft and mechanically-operated fuel and starting valves replaced by a new camshaft operating the accumulator-type fuel pump, charging pump, and air distributor. A new air starting system is also used which enables the complete elimination of reversing gear, and this consists of pneumatically-operated starting valves in the engine cyl, and a rotary distributor to operate these valves. U. M.

116. New diesel locomotives for the German State Railways. A. F. Roozeveld van der Ven. *Ingenieur, 's Grav.*, 19.6.53, **65** (25), W113–16.—The Bundesbahn has taken into service 10 new 800–1000-h.p. diesel mechanic locomotives, details of which are given in this article. The engines are manufactured by Daimler–Benz, M.A.N., and Maybach. Use is made of variable liq clutches of the type Voith T36 and Maybach–Mekydro K104 and of 4-speed gearboxes, both of which are described in some detail. 5 drawings are included. G. F. T. C.

SAFETY PRECAUTIONS

117. Recent fire extinction tests. Anon. *Petroleum, Lond.*, Sept. 1953, **16** (9), 259.—Of all the media tested by the Air Ministry, most efficient was chlorobromomethane. Details of tests and results are given. G. H. G.

118. Developments in vaporizing liquid fire extinguishers. A. G. Thompson. *Petroleum, Lond.*, Sept. 1953, **16** (9), 258–9.—Results compared in Great Britain and the U.S.A. to developments of new vaporizing liq for extinguishing fires which involve inflammable liq. Promising development in the U.S. with new agents containing fluorine and bromine. 14 different compounds are tabulated, and their effectiveness and physical properties compared. From laboratory results, concluded that the most effective stable agent would be a bromofluoro carbon having a single atom and at least 2 fluorine atoms per mol. A survey undertaken by the Fire Research Station has been confined to a study of comparative efficiencies, effectiveness of inhibitors increases in the order CCl_4, CH_3Br, CH_3I. Fluorine compounds containing bromine appear to be superior to those used at present not containing fluorine, but substitution of chlorine for bromine reduces the efficiency. G. H. G.

119. Fire precautions in oil installations. E. E. Chanter. *Petroleum, Lond.*, Sept. 1953, **16** (9), 252–7.—Guide to the fire prevention and protection for petroleum refineries is given.

Fire protection entails: (1) prevention; (2) limitation and control of fires; (3) extinction of fires. Precaution arrangements include sound design and construction of plant, regular and efficient maintenance education of operatives, careful planning. Methods of combating fires are outlined. G. H. G.

120. Fire research 1952. Anon. *Petroleum, Lond.*, Sept. 1953, **16** (9), 243–9.—Report on the work of the Government-sponsored Joint Fire Research Organization of Great Britain. Reports deal with the extinction of fires by water, foam, vaporizing liq, wetting agents, and the hose through which water is applied, with particular reference to the case of petroleum. Figures are given for the effect of water sprays on a kerosine fire. G. H. G.

121. Safety precautions during cleaning of railway tanks. J. Karczmarski. *Nafta (Krakow)*, 1952, **8**, 332–4.—After classifying fluids into toxic, inflammable, and safe groups, author describes safety precautions and stresses the need for training all workers who deal with railcars in safety precautions and hygienic procedure. Importance of correct diet for cleaners is stressed. M. S.

MISCELLANEOUS

122. Training engineers for the petroleum industry. T. B. Sansom. *Petroleum, Lond.*, Aug. 1953, **16** (8), 214–17. The link of the petroleum technologist with the chemical engineer is considered. Existing methods of training are classified and analysed, together with a programme giving a modification of the present university course. G. H. G.

123. The effect of oil upon American industry. G. Egloff. *Petroleum, Lond.*, July 1953, **16** (7), 192–5.—The far reaching effect of the development of the oil industry is shown, an important segment of which is the petrochemical industry. Figures are given for the growth of the industry. Processing methods to meet the increasing demand in quality are summarized. The impact of the oil industry on agriculture, plastics, etc, is outlined. Inventions in the oil industry have also been used elsewhere, *e.g.*, fluid technique for handling solids is developed from the fluid cat cracking process. G. H. G.

124. Liquid fuel firing course for engineers. Anon. *Petroleum Lond.*, Sept. 1953, **16** (9), 264–5.—Course held at Cambridge primarily for users of liq fuels, including coal-tar fuels. The lectures are briefly reported. G. H. G.

125. Production and utilization of raw materials in the British chemicals industry. Pt 1. Anon. *Petroleum, Lond.*, June 1953, **16** (6), 163–5.—Abstracts from papers read at a recent symposium arranged by Society of Chemical Industry. Papers include: raw materials for petroleum-chemicals industry, special steels for petroleum industry, plant design for light olefin recovery, petrochem. and U.K. trade, synthetic ethyl alcohol, separation, and use of C_4 hydrocarbons. G. H. G.

126. A critical study of the selling price of synthetic rubber plants. H. E. Haley, D. N. McClanahan, and J. P. Street. *Petrol. Refin.*, 1953, **32** (7), 113–17.—An attempt at an economic valuation of U.S. Government owned synthetic rubber facilities which are being transferred to private ownership. The value determined here is between 45 and 70% of the current investment. R. D. S.

127. Process for recovering oil valves and drums. Anon. *Petroleum, Lond.*, June 1953, **15** (6), 162.—An American refining company has developed a new oil valve and drum recovery process. Brief description of process is given. G. H. G.

128. Government sponsored research in Britain—1951–2. Anon. *Petroleum, Lond.*, June 1953, **16** (6), 153.—Extracts from annual report include petrography, geophysics, synthesis of hydrocarbons from CO and hydrogen, and flow properties of residual petroleum oils. 2 non-technical committees have been set up: on individual efficiency in industry, and the other on human relations in industry. G. H. G.

129. Viscosity standardization. Anon. *Petroleum, Lond.*, Aug. 1953, **16** (8), 219.—New visc standard of water is 1·0038 cs at 68° F as from 1 July 1953. All kinematic visc are reduced by 0·318%. A summary of the various factors affected is given. G. H. G.

130. Industrial review. Anon. *BrennstChemie*, 1953, **34** (11–12), 44–6.—A review of the satisfactory progress of the West German coke and by-product industry is supported by relevant tables for 1951 and 1952, and by charts for 1936–52. The rapid rise in performance of the mineral oil industry and refineries from 1950 to 1952 is discussed and supported by tabulations. R. T.

131. Radioisotopes. B. F. Linz. *Oil Gas J.*, 14.9.53, **52**, 19, 106.—A review is given of the industrial value of isotopes, and their types, and organizations which have engaged in radioactive research on petroleum are listed. G. A. C.

BOOK REVIEWS

Flames—their Structure, Radiation and Temperature. A. G. Gaydon and H. G. Wolfhard. London: Chapman & Hall Ltd., 1953. Pp. xi + 340. 55*s*.

This book deals with combustion research and theory from the physical and physico-chemical aspects. As the authors point out in their preface, they have concentrated on such subjects as the measurement of flame velocity, theories of flame propagation, carbon formation in flames, measurement of high flame temperatures, and ionization in flames: the book is therefore complementary to Lewis and von Elbe's "Combustion, Flames, and Explosions," which deals especially with the chemical aspects of the subject, and overlaps but little with Gaydon's "Spectroscopy and Combustion Theory."

The chief merits of the book are a very readable exposition of its somewhat intricate subject matter, a relative freedom from typographical errors, and the many admirable illustrations. Not all of the plates are original, but they are in nearly every case excellent examples of scientific photography and each does serve to clarify some point of the text.

The petroleum technologist may be disappointed to find that the authors have dealt almost exclusively with gas flames and have had little to say on the subject of droplet combustion. This perhaps merely serves to emphasize the paucity of our knowledge in this field, but a certain amount of work has been published and theories have been formulated which might receive more detailed treatment if a second edition of the book is ever contemplated. G. H. B.

Diesel Engine Design. 2nd Edn. T. D. Walshaw. London: George Newnes Ltd. Pp. 440. 35*s*.

This book covers pretty well every phase of the subject. Starting with the principles of thermodynamics and of combustion, followed by a survey of engine types and the determination of engine size, it discusses the design of the various component parts which go to make the complete engine. In doing this the physical properties of materials as well as the fundamental principles of machine design, as affecting engine parts, are discussed. The influence upon

the ultimate working stress of factors other than the major forces is dealt with in some detail and in a way which should be of great assistance to the student in appreciating what it is needful to take into account in the production of a mechanically sound design.

A useful introduction is given to the all important subjects of torsional vibration and balancing. In addition to imparting a large amount of information, the book gives numerous references to other works where more detailed information may be obtained. These references are collected in a bibliography at the end of the book.

In the concluding chapter there are nearly forty pages showing sectional arrangement drawings of a representative selection of engines ranging from a very small high-speed engine up to a slow-speed engine having a cylinder diameter of 16 inches and developing 200 b.h.p. per cylinder.

The book deals mainly with the medium-speed engine and the smaller sizes of slow-speed engine but includes a few references to details of the lighter high-speed types. These latter, in the absence of reference to all parts of such engines, seem a little out of place.

The book is a very comprehensive survey of the subject, and should prove most helpful to the young designer and the student. It has the great virtue of being most readably written and even the experienced designer should find much that is of value and interest to him. C. B. D.

Jahrbuch der Technischen Hochschule Hannover. Dusseldorf: Verlag Gierson & Co., 1952. Pp. 216.

The self-avowed purpose of this very well-produced year book of the Hanover Technical High School is to give friends and well-wishers news of the intra- and extra-mural life of the College, and at the same time to win new friends.

Starting with a report of the outgoing Rector for the Academic year 1950/51, the inaugural address of the new Rector is then given, on the subject " Building—Tradition—Restoration " which deals with certain architectural aspects of the reconstruction of war destroyed areas.

Various short articles then follow on academic and student matters, including one on " Post War Developments in British Universities," by Sir Philip Morris. The rest of the book is made up of short, interesting, well-illustrated articles on such matters as modern architecture, and historic and technical subjects—including one on the technical and economic possibilities of the Fischer–Tropsch process. N. K.

ADDITIONS TO THE LIBRARY

The Instrument Manual. London: United Trade Press. 2nd Edn. 1953. Pp. 628 + 105. £4 4*s*.

With many more pages than its predecessor, this second edition of " The Instrument Manual " includes several new sections, not the least important of which is one of eleven pages on viscosity measurement. Other new sections are those dealing with aeronautical instruments, navigational instruments, meteorological instruments, surveying instruments, measurement and control of conductivity, telemetering, and nucleonic instruments.

The editor was faced with a truly formidable task, for in regard to any one of the 25 subjects discussed a full-size text book could have been written. Yet he appears to have concentrated into an average of about 23 pages per subject a mass of information regarding instruments, their operation, and their maintenance, each illustrated with excellent line and half-tone illustrations. Of considerable importance also is the bibliography appended to each chapter and a buyers' guide. The index is excellent, and the book will prove invaluable to all who have to do with instruments of any kind.

Marking Containers. London: Association of British Chemical Manufacturers, 1953. Pp. 90. 7*s*. 6*d*. post free.

This book outlines a system of warning labels for hazardous chemicals. It is intended to warn that some products need special care, is applicable only to the U.K., and primarily to quantities in excess of 6 pints or 8 lb. Specimen wording for labels for over 200 chemicals is given, and general principles are laid down for devising labels for other products.

I.C.I. Engineering Codes and Regulations. Group B, Vol. 1. 2. Construction and maintenance (Mechanical Engineering). Safety precautions. London: Imperial Chemical Industries Ltd., 1953. Pp. 68. Obtainable from Royal Society for the Prevention of Accidents, Industrial Safety Division, 38 Millbank, London, S.W.1.

Detailed safety precautions to be observed in mechanical engineering construction or maintenance work.

Catalytic Enrichment of Industrial Gases by the Synthesis of Methane. Fuel Research Technical Paper No. 57. London: H.M.S.O., 1953. Pp. 51. 2*s*. net.

Describes laboratory and intermediate scale investigations of the enrichment of industrial gases by synthesis of methane using nickel catalysts. Methods of construction to process 20,000 cu. ft/hr of water-gas are recommended.

Fifth Empire Mining and Metallurgical Congress, Proceedings.

Vol. I. Geology of Australian Ore Deposits. Ed by A. B. Edwards. Pp. 1290 + xiv. £A4 4*s*.

Vol. II. Mining Methods in Australia and adjacent territories. Ed by R. P. Hooper and A. B. Black. Pp. 374 + xvi. £A2 10*s*.

Vol. III. Ore Dressing Methods in Australia and adjacent territories. Ed by H. H. Dimkin. Pp. 317 + x. £A1 17*s*. 6*d*.

Vol. IVA. Ferrous Metallurgy. Ed by J. C. Richards. Pp. 217 + xii. £A2 5*s*. 6*d*.

Vol. IVB. Non-Ferrous Metallurgy. Ed by F. A. Green. Pp. 272 + viii. £A1 15*s*.

Vol. V. Miscellaneous Features and Practices. Ed by A. W. Norrie. Pp. 253 + x. £A1 15*s*.

Vol. VI. Coal in Australia. Pp. 832 + x. £A3 15*s*.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

132. Geomicrobiology in petroleum industry. A. Luchterowa. *Bull. Polish Inst. Petrol.*, 1952, **2**, 7–8.—Geomicrobiology is being employed to solve the questions of origin of petroleum, its separation from sedimentary rocks, and petroleum prospecting. The various breeds of bacteria are briefly described, and their appearance in known oil-bearing areas points to a new way of prospecting. The metabolism of various kinds of these bacteria enables some to reduce sulphates, some to consume paraffins, others to oxidize aromatics, but paraffins with 10–16 C atoms are easiest to attack. Presence of gaseous paraffins in subsoil over petroleum reservoirs is affected by these bacteria. In the Soviet Union some 18,000 samples, half from known areas, are being correlated with the known subterranean structure. M. S.

133. Odd geologic structures of Southern Oklahoma. Pt 2. C. W. Tomlinson. *World Oil*, Jan. 1953, **136** (1), 90.—These include compressional "normal" faults locally reversed, propeller faulting, fan folding, and horst-grabens.

Test pits dug along the Criner fault, near the Brock field, showed it to have a hade of 5°–20° from vertical, of normal character, sloping toward the downthrow side. To the southeast along the fault trace drilling shows the fault plane to be of thrust character with a hade of 45° in the opposite direction from its normal hade farther north.

Propeller faulting is illustrated by the 70 mile long Washita Valley fault. The stratigraphic displacement on the fault zone diminishes till it passes a hinge point and reverses the direction of displacement. There are also 2 other hinge points, the fault plane being warped like a propeller blade, in opposite directions at opposite ends, either side of its group of hinge points.

West of the Washita river part of the southern limb of the Arbuckle anticline is overturned towards the Ardmore syncline. At this point this uplift assumes a type of fan folding, the overturning being from the higher structural element to the lower.

Near Woodford and Crusher are two examples of a longitudinally tilted graben rising into a horst between the same pair of bordering faults. Each fault is scissored in the same direction as the other, with a hinge point between the horst and graben ends of the intervening block.

Each type of structure is described in detail, whilst numerous diagrams and photographs are included.

W. S. R.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

134. Hydrochemical prospecting for petroleum reservoirs. J. J. Glogoczowski and K. Szypulowa. *Nafta* (*Krakow*), 1952, **8**, 145–7.—At the present it is impossible to draw definite conclusions about the meaning of relative values of the ions found in water in 3 different geological formations, but it seems a promising indication of presence of hydrocarbons at greater depths. The ions considered are HCO_3^-, Cl^-, $SO_4^{=}$, Ca^{2+}, and Mg^{2+}. 3 tables give numerical results. M. S.

135. Utilization of logging by natural gamma radioactivity for correlation of strata in boreholes. J. Strzetelski and J. Szymanski. *Bull. Polish Inst. Petrol.*, 1953, **3**, 1.—A brief report on work of Geoanalytical Division of Polish IP in the field of natural γ radiation carried out in old and new boreholes. This method enables correlation to be extended. Further work will include neutron logging. M. S.

DRILLING

136. Cycle of operations in rotary drilling of an oil well. W. Kulczycki. *Nafta* (*Krakow*), 1953, **9**, 62–6.—Author submits this as a large scale time-and-motion study time-table which should prove useful in eliminating waste. By dovetailing certain preparatory operations an instance of practical arrangements given shows a cutting of 102 days' work down to 93. M. S.

137. Directional drilling of wells from an inclined mast. J. Borowski. *Nafta* (*Krakow*), 1952, **8**, 295–9.—For directional drilling, required especially often near the Caspian Sea, this new method is most useful. Usual directional drilling is as speedy as vertical drilling in the U.S.S.R., the average being 1000–1200 m/rig/month and max 2470 m/rig/month, but maintenance of required direction is troublesome. In the new method the inclined tower is 42 m long and supported on one side by a leaning pylon. Drilling mechanism rides on a trolley. Inside the drill-hole the float is loaded with interchangeable weights and the ratio of upward thrust of the float (P) and weights attached (Q) determines the directional consistency of progress, *e.g.*, for an intended inclination 27°, $P:Q$ ratio = 1·18 was too high and inclination rose; for $P:Q$ = 0·8 inclination settled at 31°, and for $P:Q$ = 0·727 it fell rapidly. At 1900 m the error of position of well bottom was 10·5 m = 1·2%. Faster drilling seemed to direct a "fish-tail" drill to the right and ordinary drill to the left. The mud was composed of NaOH and lignite. 2 drills were lost, *i.e.*, broke off and were left in the hole, new progress by-passing the tool. Full analysis of progress is included in article. M. S.

138. Methods of lowering the viscosity of drilling mud. T. Filipowicz. *Bull.* (*Polish*) *Inst. Petrol.*, 1953, **3**, 3.—For universal use there are $Na_2H_2P_2O_4$ by itself, with Na_2CO_3 or with "post-sulphitic" alkalis (from manufacture of cellulose) and $(NaPO_4)_3.nH_2O$.quebracho, Na_2CO_3, and NaOH for special circumstances. Also sodium salts of humic acids, suitable for slight changes of visc. M. S.

139. First experiments with starch as an additive for drilling muds based on Polish loams. T. Filipowicz. *Nafta* (*Krakow*), 1953, **9**, 85–7.—Conditions in which normal mud fails and starchy mud is required are listed. Starchy mud should not filter through, should have S.G. = 1·2, and whilst its primary structural resistance does not exceed 0·5 "shear units," secondary structural resistance is 10. Its pH lies between 8 and 10, but when bentonite is used it may be allowed to rise to 14. Several Polish loams are suitable for addition of starch. Methods of preparation of starch and of starchy drilling muds

suitable for alkaline conditions, contamination with lime, and contamination with brines are given, as well as results of several tests on various muds so prepared. M. S.

140. On experiments in drill pipe strength. J. Wojcik. *Nafta* (*Krakow*), 1953, **9**, 7–9, 32–4.—To increase rate of drilling greater stresses must be applied to drill pipe. With increased vibrations failures may occur. These depend on mechanical resistance of joints, quality of pipe surface, and the kind of medium in which it is working (its pH). Although automatic rejection of pipe after prescribed meterage can be employed, it is wasteful, and periodical inspection is preferable; simple methods include visual inspection, pressure test, and measuring of pipe thickness, more complicated are: magnetic, inductive, by γ rays, supersonic, and optical. As general precautionary measures author stresses the importance of careful transportation, correct drilling methods, regular changes in the position of each pipe (rotation), and periodical inspection. M. S.

141. Gas stove for sharpening of drilling bits. J. Ostaszewski. *Nafta* (*Krakow*), 1953, **9**, 17–19.—A newly designed, by Polish IP, transportable stove is fully described with sketches. It is claimed that it effects *ca* 35% economy. M. S.

142. Spectrochemical logging of oil wells. Z. Biernat and J. J. Glogoczowski. *Nafta* (*Krakow*), 1953, **9**, 4–7.—Geochemistry is useful to the driller in so far as it allows him to identify and correlate rocks encountered during drilling. In particular, it tells him about movement and proximity of hydrocarbons, but for purpose of identification Mg, Fe, Sr, and Al are considered. Chemical analysis which can keep pace with drilling can only be done by spectroscopy. Details of equipment and analytical procedure are given and followed by analytical results. M. S.

143. Patents. U.S.P. 2,626,221 (26.2.48; 20.1.53). C. H. Elliott, assr to Reed Roller Bit Co. Hard surfacing material *A* is applied to the teeth of a rotary metal cutter for an earth drilling bit by covering the teeth with a pasty sodium silicate soln, embedding *A* in granular form in the covered surface, drying the surface by heating the cutter, and rotating and axially reciprocating the cutter while playing a flame on the teeth until the temp of the teeth determined pyrometrically reaches a predetermined value at which *A* is bonded to the metal.

U.S.P. 2,626,305 (12.12.49; 20.1.53). R. F. Krueger, assr to Union Oil Co of California. Electric logging of a bore hole drilled with a fluid comprising $\leqslant$60 wt % mineral oil, 1–20 wt % water, and 1–20 wt % of an alkali or alkaline earth metal soap of a C_{2-35} carboxylic or sulphonic acid, by establishing a voltage gradient zone of $\leqslant$100 V/in in a vertical portion of the borehole to effect breakdown of the fluid and passing electrical energy from an electrode in this zone to the surrounding wall.

U.S.P. 2,624,950 (25.10.49; 13.1.53). J. A. Mitchell. Gauge for aligning a string of pipe with a grade line.

U.S.P. 2,624,952 (31.1.49; 13.1.53). A. R. MacLagan, assr to Eastman Oil Well Survey Co. Earth bore inclination indicator comprising a plumb bob carrying a marking element, a record member *A* mounted to rotate on an axis corresponding to the axis of the bore and which engages the marking element only on rotation, and time controlled means for rotating *A*.

U.S.P. 2,626,128 (24.9.51; 20.1.53). E. G. Boice, assr to Reed Roller Bit Co. In a drill bit are provided rollers having hard balls embedded therein and protruding therefrom to crush hard formations.

U.S.P. 2,626,533 (12.10.49; 27.1.53). E. J. Huckshold, assr to Central Mine Equipment Co. Manufacture of Y-shaped bits for mining drills.

U.S.P. 2,626,780 (6.6.51; 27.1.53). J. E. Ortloff, assr to Standard Oil Development Co. Drill bit assembly comprising a tubular case that is attached to the lower end of a drill pipe, the case carrying on its lower end a coring head, *e.g.*, a conventional diamond core head, behind which is rotatably mounted secondary cutting means on a central shaft which is driven by a multi-stage hydraulic turbine built into the assembly. The rotor plates of the turbine are on the central shaft driving the secondary cutting means, and the stator blades are in the outer case which drives the coring head.

U.S.P. 2,626,782 (16.10.44; 27.1.53). R. A. McCallum, assr to Joy Manufacturing Co. Reversible mounting for drilling apparatus.

U.S.P. 2,626,127 (8.10.48; 20.1.53). R. R. Crookston, assr to Standard Oil Development Co. System for controlling a rotary drilling rig responsive to the weight carried on the drilling line and the torque exerted by the drilling engine, the weight control system taking control and inactivating the torque control while drilling conditions are normal, and the torque control taking command and inactivating the weight control when the torque exceeds a normal value.

U.S.P. 2,624,549 (24.3.47; 6.1.53). O. G. Wallace. Method of rotary drilling which provides for a predetermined weight on the drill string by interposing a weight tool at a point above the bit in the drill string which will only permit drilling for a predetermined distance. The tool stops the drilling with any additional weight of the drill string.

U.S.P. 2,626,190 (4.11.49; 20.1.53). E. G. Boice, assr to Reed Roller Bit Co. Tool joint of the shrink grip type having a portion on which hard metal may be welded without permanently disturbing the connection between the joint and the pipe.

U.S.P. 2,626,781 (22.12.47; 27.1.53). E. G. Reynolds, assr to Houston Oil Field Material Co. A combination jar and safety joint so that stuck pipe below the joint may be jarred loose or, if this is not possible, the invention provides for disengaging the upper section of the joint from the jar and consequently from the lower section to enable the upper section to be withdrawn from a well.

U.S.P. 2,626,177 (5.5.47; 20.1.53). W. A. Maxwell and J. A. Engstrand, assrs to Grant Oil Tool Co. Tool for hydraulically displacing well materials.

U.S.P. 2,626,829 (5.5.47; 27.1.53). W. A. Maxwell and J. A. Engstrand, assrs to Grant Oil Tool Co. Displacement or recovery of solid bodies in oil wells by creating a fluid surge by opening a low pressure chamber in communication with the displacement zone. V. P. P.

PRODUCTION

144. The principles of modern exploitation of crude oil and micro-hydraulics (of oil reservoirs). Z. Wilk. *Nafta* (*Krakow*), 1953, **9**, 66–71, 88–92.—Correct flow of oil and gas through the capillary tubes formed by oil-bearing sands can lead to 70–80% exploitation of the reservoir. The branch of science dealing with such flow is called by author micro-hydraulics. Such flow is governed by the formula $dP = \frac{-\eta Q}{kF}\,dx$, where dP/dx = fall of pressure with distance, Q = volume of liq or gas, k = porosity of rock, η = kinetic visc of fluid, and F = cross-sectional area at right angles to x.

Assuming that fluid is incompressible, that k and η are constant, and that the movement is directed towards the centre, this formula can be integrated thus:

$$\int_{P_r}^{P_R} dP = \frac{Q\eta}{2\pi mk}\int_{r}^{R}\frac{dx}{x};$$

For flow of gas 2 formulæ are given: for linear flow—

$$P_2^2 - P_1^2 = 1262\, z\eta_{av.}\, T_{av.}\frac{V_N L}{k_{av.} F} \text{ in } At^2$$

and for centripetal flow—

$$P_2^2 - P_1^2 = 462 z\eta_{av.}\, T_{av.}\frac{V_N \log (R/r)}{mk_{av.}} \text{ in } At^2$$

where z is coefficient of compressibility, L = length, m = dia of path, R = outer radius, r = inner radius (all in metres), η in cP, k in mD, V_N in m³/min at NTP and F in m².

For crude oil

$$P = 367\eta_{\text{av.}} \frac{Q \log (R/r)}{mk_{\text{av.}}} \quad (Q \text{ in cm}^3/\text{sec})$$

Subterranean pressures, specific gravity, and solubilities of gas and oil play an important part in determination of flow rates.

Careful preparatory work pays good dividends. During operations it is important to keep a check on pressures and rates of flow of crude, gas, and water. In repressurizing or flooding equally careful note must be made of relative quantities of fluids entering and leaving the field. 2 further points are made, one regarding co-operation with a qualified geologist, which is necessary, and the other regarding size and power of compressors required by industry. The whole paper has a direct bearing on the plans and requirements of Polish petroleum production. M. S.

145. Method of estimating reserves of crude oil and natural gas. J. J. Zielinski. *Nafta* (*Krakow*), 1953, **9**, 57–62.—There are 2 basic types of methods: static and dynamic, the first giving total reserves, whilst second gives the available reserves. Since calculation of volume involves permeability porosity and saturation of sands, the first method gives uncertain results. Dynamic methods are: "production curves" method, "diminishing returns" method, "infinite number of boreholes extrapolation" method, 2 other graphical methods, and "material balance" method. During 1948–49 the Petroleum and Natural Gas Department of Main Institute of Geology calculated Polish reserves using dynamic method of average production and classifying deposits according to Soviet usage as (A1) certain; (A2) known; (B) discovered; (C1) suspected, and (C2) possible. Tables give total tonnage produced up to 1947, average production from one area, and total reserves balance sheet. M. S.

146. Cost of crude oil productions by flooding. S. Brincken. *Nafta* (*Krakow*), 1953, **9**, 93–4.—A complete estimate based on cost of similar operation elsewhere comes to over £4000 per 10,000 m³. This area would be expected to yield 2500 m³ crude per annum. Refs to 2 papers. M. S.

147. Conditions of rational exploitation of natural oil flow. R. Kruczek. *Nafta* (*Krakow*), 1952, **8**, 147–52.—From consideration of crude saturated with gas in the reservoirs the conclusion is drawn that it is advantageous in the long run to limit exploitation, and thus to prevent separation of gas and liq underground. Full and deep sampling is necessary. M. S.

148. Hydrochemical prospecting of oil fields (chemistry of subterranean waters in oil-bearing regions). W. Chajec. *Nafta* (*Krakow*), 1953, **9**, 27–32.—The Brines Section of the Polish IP has occupied itself with subterranean waters from the standpoints of: (1) their interference in production; (2) source of geological information; (3) source of hydrostatic data; (4) source of information on origin of petroleum; (5) their industrial and medicinal uses. Subterranean waters are classified according to ions present in them, and some particular ratio of ions may serve to identify particular source of water. Several methods of representation are quoted. One particular anticline with several faults had its subterranean waters subjected to 315 analyses, which, properly interpreted, are given in the form of tables and conclusions. M. S.

149. Sand and water filter (for well-bottom pumps) "BeA." A. Bania. *Nafta* (*Krakow*), 1953, **9**, 15–17.—An internal sleeve (acting as a baffle) level with perforated pipe (acting as a filter) situated *ca* 2·5 m above well bottom and *ca* 15 m below pump allows sand to settle down, whilst water may be removed even if only little has collected between pumpings. Thus the existence of a constant head of water in the well is made impossible, and sand does not enter pump. Pumping stops when crude level falls below the pump, where a vent is made. M. S.

150. Analysis of underground pump action by hydraulic dynamograph. L. Szefer. *Nafta* (*Krakow*), 1952, **8**, 179–83.—Dynamograph is an engine indicator in which pressure is transmitted by means of liq filled capillary to a recording unit. The one described is DGP-1. The pumping action underground is transmitted by means of a polished rod to the hydraulic chamber of the dynamograph. Theoretical and actual graphs are given for correct and incorrect pumping action. M. S.

151. Patents. U.S.P. 2,626,239 (28.7.49; 20.1.53). C. R. Wagner, W. N. Axe, and C. M. Himel, assrs to Phillips Petroleum Co. A filter cake having a low rate of filtration of fluid therethrough is formed on the wall of a well by circulating a water-base drilling mud containing a water-sol sulphonated cellulose derivative of the general formula $(X(OH)_3.ORSO_3M)_n$, wherein X is a glucose residue; R is a C_{1-3}-alkylene or a C_{1-3}-alkylene phenylene group; M is an alkali or alkaline earth metal or ammonium; and n is an integer; a sufficient number of the hydroxyl hydrogen atoms being replaced to render the mol water-sol. V. P. P.

U.S.P. 2,630,069 (20.5.46; 3.3.53). T. S. Harris. Automatic control unit for deep well jet pumps.

U.S.P. 2,630,070 (3.8.50; 3.3.53). L. Davis, assr (in part) to G. W. Harris. Reciprocating well pump.

U.S.P. 2,630,071 (18.10.50; 3.3.53). L. Davis, assr (in part) to G. W. Harris. Double-acting pressure fluid lift pumps for wells.

U.S.P. 2,630,073 (12.11.47; 3.3.53). V. A. Kagay. Well flow apparatus.

U.S.P. 2,630,182 (19.2.47; 3.3.53). R. L. Klotz, assr to Seismograph Service Corpn. Method for shooting oil wells.

U.S.P. 2,630,306 (3.1.52; 3.3.53). L. P. Evans, assr to Socony-Vacuum Oil Co. Subterranean retorting of shales.

U.S.P. 2,630,307 (9.12.48; 3.3.53). J. W. Martin, assr to Carbonic Products Inc. Destructive dist of oil shale *in situ*.

U.S.P. 2,631,670 (30.9.48; 17.3.53). A. L. Armentrout. Apparatus for handling fluid in a well.

U.S.P. 2,631,673 (15.7.48; 17.3.53). M. H. Halderson and W. L. Morris, assrs to Phillips Petroleum Co. Acidizing drill holes by directing a circular orifice towards the walls of the drill hole and intermittently applying high pressure to a body of acid to force it through the orifice at high velocity, to form a plurality of vortices which move through the liq in the well to the sides of the drill hole.

U.S.P. 2,631,674 (5.4.50; 17.3.53). F. L. Carson, assr to J. M. Huber Corpn. Elongated paraffin scraper blade for attachment to a sucker rod.

U.S.P. 2,632,324 (2.12.49; 24.3.53). L. M. Oberlin, assr to Phillips Petroleum Co. Apparatus for determining permeability.

U.S.P. 2,632,401 (15.1.47; 24.3.53). E. W. Mong. Well pumping apparatus.

U.S.P. 2,632,512 (8.11.50; 24.3.53). P. E. Chaney and W. E. Barnes, assrs to Sun Oil Co. Device for sampling formation fluid.

U.S.P. 2,632,513 (4.7.45; 24.3.53). E. O. Bennett, assr to Continental Oil Co. Gas lifting device for flowing multiple zone wells.

U.S.P. 2,632,795 (1.6.51; 24.3.53). F. G. Boucher, assr to Standard Oil Development Co. Retractable electrode for measuring electrical properties in a well casing.

U.S.P. 2,632,801 (5.6.48; 24.3.53). C. A. Donaldson. Deep well camera.

U.S.P. 2,632,836 (8.11.49; 24.3.53). C. S. Ackley, assr to Thermactor Co. Oil well heater.

U.S.P. 2,633,015 (11.10.48; 31.3.53). W. L. Morris, assr to Phillips Petroleum Co. Portable apparatus for testing the permeability of cores.

U.S.P. 2,633,086 (19.6.47; 31.3.53). J. Zaba, assr to McEvoy Co. Gas lift system for wells.

U.S.P. 2,633,200 (28.4.47; 31.3.53). G. H. Humason. Sample taking tool for wells.

U.S.P. 2,633,202 (30.7.49; 31.3.53). A. C. Hartsell. Well fluid stabilizer. J. M. S.

TRANSPORT AND STORAGE

152. Measuring container contents by echo sounding. H. Thiede and G. Daniel. *Erdöl u. Kohle*, 1953, **6**, 554–6.—Installation for gauging contents of LPG tanks by echo from liq/gas interface. Ultrasonic magnetostrictive transmitter and receiver are mounted against tank bottom, sound frequency is selected at optimum value suiting wall thickness. Velocity of sound in LPG varies with temp (600–900 m/sec for propane, 850–1000 m/sec for butane), so reflector rod is mounted in tank at 1 m level. Echo is registered on sensitized paper drum, and recorder speed is adjusted so that echo from reflector rod coincides with 1 m mark, thus allowing for variable sound velocity through liq. Numerous tank units can be successively connected to one recorder, which can be in pump house at distance from tanks. 5-cm level changes can be estimated. Description of apparatus and layout thereof given. V. B.

153. Underground product storage. Anon. *Petrol. Refin.*, 1953, **32** (8), 148.—A brief account of the Esso Standard Oil Co's plans to adapt abandoned slate pits in Pennsylvania for use as underground reservoirs for seasonal storage. R. D. S.

154. How to size tanks—farm and delivery lines. E. A. Birge. *Oil Gas J.*, 21.9.53, **52** (20), 178.—Line sizes can be simply and rapidly determined with the aid of charts which are given for the modified Hazen–Williams formula. G. A. C.

155. Sizing crude oil pipelines. W. L. Kennedy and C. C. Stueve. *Oil Gas J.*, 21.9.53, **52** (20), 183.—A method is presented which affords reasonably accurate results in the proper sizing of pipelines. The data should not be used as a guide for measurement of instrument and transportation cost for any particular line. G. A. C.

156. Examination of leaks in gas pipelines. K. Jahoda. *Nafta* (*Krakow*), 1952, **8**, 283–4.—Leaks in gas pipelines are a source of loss as well as danger. They are signalled by lack of material balance from one end of the system to the other, or by excessive loss of pressure. Since there are no known methods of locating the leak apart from regular inspection of the line, author hopes that " Inventors' Clubs (Rationalizers) " may make a contribution here. M. S.

157. Single pipe system for pumping crude oil and natural gas from the well to the storage tank. J. T. Strzelbicki. *Nafta* (*Krakow*), 1953, **9**, 39–42.—Totally enclosed exploitation equipment prevents loss of light hydrocarbons which generally reach 5%. Certain difficulties in construction of such equipment are now overcome by author's invention (Polish Patents P.76271 and P.35601). Instead of separating crude oil and natural gas at well and leading them to separate tanks, both are taken into one tank (gas), from which lower layer (oil) is then removed. Gas is then transferred to another tank, where natural gasoline is removed by compressing it to 5 atm. M. S.

158. Standard 18,300-ton German tanker. Anon. *Mot. Ship*, Oct. 1953, **34** (403), 290.—The 14-knot *Ernst G. Russ*, propelled by a 7200-b.h.p. M.A.N. 2-stroke single-acting engine and built by Deutsche Werft, is at present the largest vessel in the German mercantile fleet. The total tank capacity is 871,262 cu. ft. The article is illustrated by photographs, and includes general arrangement and engine-room plans. U. M.

159. Vicissitudes of tanker building and ownership. Anon. *Mot. Ship*, Oct. 1953, **34** (403), 295.—This short article reviews a book published in Norway by Knut Utsen Kloster, " Perler på en snor " (A string of pearls). The book gives a history of tanker building and ownership, and shows how freights and oil production have fluctuated during this century. U. M.

160. John I. Jacobs and Co's world tanker fleet reviewed. Anon. *Petrol. Times*, 16.10.53, **57** (1466), 1038.—This article gives an analysis of prospects for the next few years. It is estimated that all vessels of over 20 years of age by end of 1957 will have been scrapped. Tables show increase in transportation capacity and world tanker fleet of 2000 dw tons and over. G. A. C.

161. Patents. U.S.P. 2,647,654 (3.7.50; 4.8.53). A. Cibulka. A storage tank for liq having a verticle cyl wall and a roof floated upon the liq in the tank and having its periphery spaced annularly inwardly of the tank wall by a flexible outwardly and downwardly bowed annular sealing member carried by the roof spanning the space and engaging the tank wall.

U.S.P. 2,647,657 (24.1.50; 4.8.53). C. P. Krupp, assr to B. F. Goodrich Co. A diaphragm for a storage tank comprising a cover portion and an apron portion about the cover portion. D. A. R.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

162. Influence of viscosity on mixing conditions for two liquids flowing under pressure. E. Klosse. *Erdöl u. Kohle*, 1953, **6**, 459–62.—Special case is considered of mixing of water with foam compound (3–5%), visc of which is temp dependent. Examples are given and effect of pressure drop on mixing calc; it is desirable that both fluids should reach the mixing valve at about the same pressure, which can conveniently be accomplished by throttling the foam line. V. B.

163. Entrainment eliminators save money. S. C. Reynolds. *Petrol. Refin.*, 1953, **32** (7), 138–40.—Enumerates the advantages of knitted wire mesh entrainment separators, which are claimed to remove 99% of the entrained liq from the gas stream for velocities of 2–12 f.p.s., and because of their 98% free vol give very small pressure drops. R. D. S.

164. Heat transfer. B. E. Lauer. *Oil Gas J.*, 21.9.53, **52** (20), 348; 28.9.53, **52** (21), 146; 5.10.53, **52** (22), 301; 12.10.53, **52** (23), 171.—Pt 43 of this series continues with coeff of heat transfer between surfaces of a vertical tube, streamline shapes, and solids and fluids.

Pt 44 deals with coeff of heat transfer through film between outside surface of rectangular tube and hexagonal tubes and a gas.

Pt 45 goes on to coeff of heat transfer through film between outside surface of hexagonal or rectangular tubes and a gas or a liq.

Pt 46 continues with coeff of heat transfer through film between outside surface of a hexagonal tube, inside of a cool tube, and a liq. G. A. C.

165. The separation of liquids from gases in cyclones with a general discussion about collecting efficiency. H. J. van Ebbenhorst Tenbergen. *Ingenieur, 's Grav.*, 18.9.53, **65** (38), 82–8.—The efficiency of a cyclone is defined as percentage elimination of the liq contaminant, but in order to obtain comparable results, this efficiency must be expressed for narrow ranges of particle sizes. The experimental difficulties encountered in testing cyclones for liq particle separation are great as a result of coalescing and evaporation of the droplets. The performance of a cyclone is compared with the conventional mist separators such as ring- or saddle-filled towers and packs of corrugated metal sheets, and the limitations of the various systems are given. Cyclones are capable of separating large quantities of liq with moderate energy losses, but are unsuitable for very fine mists. Diagrams of several commercial liq separators are included. 16 refs. G. F. T. C.

166. Flow phenomena in cyclones. L. J. F. Broer. *Ingenieur, 's Grav.*, 18.9.53, **65** (38), 77–82.—Cyclone flow, due to its complexity and high degree of turbulence, is at present not amenable to a fully theoretical treatment. Various useful conclusions, however, can be drawn by a more or less qualitative interpretation of measured flow patterns by means of approx equations of motion. The influence of various design changes on separation efficiency and pressure loss is discussed. It is as yet not possible, however, to derive a quantitative expression of these performance data into the design parameters. There are some indications that in the case of cyclone swirls and hydrocyclones with large underflow somewhat better prospects for a theoretical treatment do exist. (Author's Abstract.) G. F. T. C.

167. Radiation and furnace design. G. J. Gollin. *J. Inst. Fuel*, Sept. 1953, **26** (152), 151.—The fundamental principles underlying furnace design are discussed, including methods of heat transfer and the nature of thermal radiation. A comparison is made between the radiation of a black body and that from CO_2 and H_2O. Radiation from burning fuel oil is considered; the radiation is high due to the carbon particles, the size of which is of primary importance.

The basic principles considered in the first part of the article are applied to the design of 3 types of furnace: (1) where high rates of heat transfer are to be avoided, *e.g.*, air heaters and recuperaters and oil stills; (2) where radiation and convection are usefully employed, *e.g.*, water-tube boiler and the shell boiler, and (3) a high temp furnace which cannot be made to work efficiently unless the utmost advantage is taken of the radiating qualities of the flame, *e.g.*, the glass tank and the open hearth furnace. D. K.

168. Redwood cooling towers. R. F. Comeaux. *Oil Gas J.*, 21.9.53, **52** (20), 343.—Causes of deterioration and methods of maintenance of cooling towers at Humble's Baytown refinery are reviewed. Toxic sprays are used to control biological fouling, and data are given on effect of dilute alkaline and chlorine soln on resistance to decay of redwood by brown-rot fungi. G. A. C.

169. Repair of fractured machinery. Anon. *Petroleum, Lond.*, Aug. 1953, **16** (8), 218–19.—New process of "cold repair"—*in situ* without dismantling. It is equally applicable to sites where inflammable gases render welding out of the question. The basic principle is the cold-working of keys into slots cut transversely across the fracture or crack. There are 2 further developments of the system: (1) uses "studs" in conjunction with the keys, for the sealing of cracks in pipelines, tanks, and cyl; (2) inlay of high-strength alloy plates for breaks at points of conc stress in overloaded sections. Hand and pneumatic tools can be used. G. H. G.

170. Gas turbines—a survey of their industrial use for power and heat production. L. Walter. *Mech. World*, Aug. 1953, **133** (3409), 342.—The gas turbine as a prime mover is discussed, various cycles are illustrated, and applications of gas turbines for the generation of power and heat are indicated. Schemes for utilizing the heat recovered from the turbine exhaust gases for topping up a steam turbine plant, heating feedwater, and drying various manufactured products are described. As gas turbines equipped with waste heat boilers can supply 2–4 times as much heat for processing as compared with steam turbine plant, gas turbines should find many applications where, due to difficulties of heat and power balance, they are more suitable than steam turbines. 8 refs. T. T.

DISTILLATION

171. Patents. U.S.P. 2,637,683 (24.12.48; 5.5.53). L. S. Kassel, assr to Universal Oil Products Co. Dist of solid carbonaceous materials.

U.S.P. 2,637,684 (8.5.45; 5.5.53). A. C. Buffum, assr to Badger Manufacturing Co. Engine-driven vapour compression dist.

U.S.P. 2,638,412 (14.4.51; 12.5.53). J. G. Browder, assr to Standard Oil Development Co. Aviation gasoline components are made by dist a hydroformed fraction boiling in the range 85°–200° F in the presence of 0·1 lb of 2 : 6-di-*tert*-butyl-4-methylphenol per 1000 gal of said fraction at a temp $\geq$145° F to remove pentanes and lighter fractions. The bottoms fraction is a gum stable aviation component.

U.S.P. 2,638,440 (1.5.48; 12.5.53). W. M. Drout, C. S. Carlson, H. W. Scheeline, and P. V. Smith, assrs to Standard Oil Development Co. Purification of crude C_3 to C_5 aliphatic monohydric alcohols produced by the sulphuric acid–cat hydration of a C_2 to C_5 mono-olefin by fractional dist maintaining a liq reflux having a water content of 65–99·9 mol %.

U.S.P. 2,638,441 (3.10.49; 12.5.53). A. C. Nixon and C. H. Deal, assrs to Shell Development Co. In the extractive dist of hydrocarbon mixtures of lower alkylaromatic hydrocarbons and non-aromatics of similar boiling range in the presence of antimony trichloride as selective solvent, the decomposition of the solvent is reduced by adding 0·5–3·0% wt of an organic basic nitrogenous compound.

U.S.P. 2,638,442 (20.10.49; 12.5.53). T. Q. Eliot, assr to Stanolind Oil and Gas Co. An aq mixture of butyraldehyde (I) and ethyl acetate (II) is fractionally dist at pressures of 50–250 mm to give an overhead of I-water azeotrope and a bottoms fraction of II and water.

U.S.P. 2,639,130 (27.11.48; 19.5.53). P. N. Heere. Apparatus for equalising distribution in packed columns.

U.S.P. 2,639,263 (5.10.48; 19.5.53). F. W. Leffer, assr to Universal Oil Products Co. Method of dist solid hydrocarbonaceous material.

U.S.P. 2,640,013 (G.B. 30.4.48; 26.5.53). T. O. Wilton, W. L. Wilton, and L. V. Russell, assrs to Chemical Engineering Wiltons Ltd. Dist of tars and liq hydrocarbons containing residues.

U.S.P. 2,640,014 (31.1.49; 26.5.53). C. H. O. Berg, assr to Union Oil Co of California. Oil-shale eduction process and apparatus.

U.S.P. 2,640,017 (14.7.49; 26.5.53). A. R. Graff, assr to Standard Oil Development Co. Production of substantially pure anhydrous alcohols by dist.

U.S.P. 2,640,018 (25.7.49; 26.5.53). R. W. Heath, assr to Signal Oil and Gas Co. Method of steam dist.

U.S.P. 2,640,019 (1.6.48; 26.5.53). C. H. O. Berg, assr to Union Oil Co of California. Oil-shale eduction apparatus. J. M. S.

Ger.P. 876,992, 2.4.53. — Pistor, Ludwigshafen (Rhein), assr to BASF, Ludwigshafen (Rhein). Process for purifying tech methanol.

BrennstChemie, 1953, **34** (9–10). R. T.

ABSORPTION AND ADSORPTION

172. Cyclic adsorption refining. R. L. Humphreys. *Petrol. Refin.*, 1953, **32** (9), 99–101.—A discussion of the cyclic adsorption process as applied to the separation of aromatics from saturates using silica gel as the selective adsorbent. The cyclic method of operation is described, and flow diagrams of 2 typical processes are given. R. D. S.

173. Refining with adsorbents. Pt III. V. A Kalichevsky and K. A. Kobe. *Petrol. Refin.*, 1953, **32** (8), 135–7.—A discussion of the use and regeneration of adsorbents in percolation processes. R. D. S.

174. Patents. U.S.P. 2,638,405 (31.10.47; 12.5.53). H. D. Frazier, assr to Fluor Corpn. Moisture and acidic constituents are removed from gases by contacting the gas with an aq soln of methyldiethanolamine in 2 stages, the soln used in the second stage being sufficiently concentrated to dehydrate the gas.

U.S.P. 2,638,437 (30.7.51; 12.5.53). E. G. Ragatz, assr to Edw. G. Ragatz Co. Method of removing low-boiling hydrocarbons from a high-boiling hydrocarbon in a rich absorption oil and maintaining precise control of the composition of the product.

U.S.P. 2,638,999 (13.12.47; 19.5.53). C. H. O. Berg, assr to Union Oil Co of California. Adsorption process for separation of gaseous mixtures using a solid granular adsorbent.

U.S.P. 2,639,000 (G.B. 1.3.50; 19.5.53). W. E. Edwards, assr to Sutcliffe Speakman and Co. Rotating bed adsorber for separating liq from gases.

U.S.P. 2,640,008 (23.7.49; 26.5.53). R. W. Heath, assr to Signal Oil and Gas Co. Adsorption method for separating hydrocarbon gases. J. M. S.

SOLVENT EXTRACTION AND DEWAXING

175. Solvent refining with furfural. S. Niemiejoswski. *Nafta (Krakow)*, 1953, **9**, 9–12, 42–6.—Physical and chemical properties of furfural are given. Its behaviour as a solvent is compared with others and the problem of adapting existing phenol refining equipment to use of furfural is considered. Polish, Soviet, American, and English sources are quoted. 6 graphs, 6 tables, and flow diagram given. M. S.

176. Patents. U.S.P. 2,637,681 (9.12.48; 5.5.53). G. B. Arnold, H. V. Hess, and W. E. Skelton, assrs to Texas Co. Fractional separation of wax from a hydrocarbon mixture using urea or thiourea and a solvent.

U.S.P. 2,637,744 (24.2.50; 5.5.53). S. E. Jolly, assr to Sun Oil Co. Oil containing $\lt 25\%$ naphthenic acids (I) is extracted with a selective solvent for (I) composed of acetonitrile containing $\gt 25\%$ wt water.

U.S.P. 2,638,409 (Italy 28.10.47; 12.5.53). G. Bottaro. Countercurrent extraction apparatus.

U.S.P. 2,639,782 (30.7.48; 26.5.53). O. L. Polly and C. H. O. Berg, assrs to Union Oil Co of California. Normally gaseous hydrocarbon mixtures are separated by contracting with a selective solvent comprising a major proportion of a liq ring-saturated heterocyclic compound containing 2 hetero oxygen, sulphur, or nitrogen atoms and a minor proportion of formamide. J. M. S.

CRACKING

177. Gasoline reforming. K. Kachlik. *Nafta (Krakow)*, 1953, **8**, 212–15, 265–70.—A summary of cyclization, hydroforming, polyforming, and platforming procedure equipment and results. References include 3 Russian and 2 Polish books. M. S.

178. New catalytic reforming process. J. W. Teter, B. T. Borgerson, and L. H. Beckberger. *Oil Gas J.*, 12.10.53, **52** (23), 118.—The use of a new platinum reforming cat RD-150 developed by Sinclair Research Laboratories and Baker and Co is described. 2 major advantages are claimed: (1) a high ratio of paraffin cyclization activity to hydrocracking activity, and (2) an ability to be regenerated by diluted air.

The process is so flexible that operation may be conducted with or without regeneration during processing. Tables show feed-stock characteristics, continuous and regenerative operation, aromatics production, and operating costs. G. A. C.

179. How to design fluid catalytic hydroforming units. R. A. Harang. *Oil Gas J.*, 5.10.53, **52** (22), 280.—Pointers in the Destrehan, Louisiana, unit of Pan-Am Southern are given, and include mechanical design—regenerator and reactor, regenerator cooling and venting, filter blowback system, reactor feed distributor, cat storage, and slide valves. G. A. C.

180. Patents. U.S.P. 2,626,233 (5.8.50; 20.1.53). C. N. Kimberlin and E. M. Gladrow, assrs to Standard Oil Development Co. Liq saturated hydrocarbon feed stocks are cracked at 800°–1050° F under atm pressure in presence of an activated carbon cat and of $\lt$ an equimolar amount of added normally gaseous olefin.

U.S.P. 2,626,892 (9.12.50; 27.1.53). J. H. McCulley and H. P. Dayton, assrs to Standard Oil Development Co. A neutralized residual pet fraction *A* containing $\gt 0{\cdot}8$ wt % salts, including salts in excess of those naturally present, is heated to 700°–880° F, but below cracking temp. A refractory gas oil *B* b.p. 600°–700° F is separately heated to 940°–1050° F, and *A* and *B*, in the ratio 1 : 1 to 1 : 1·4, are separately charged to and mixed in a reaction zone maintained at 500 to 800 p.s.i.g. to effect cracking of *A* to light hydrocarbons, fuel oil, and coke containing said salts.

U.S.P. 2,624,697 (9.5.50; 6.1.53). E. R. Clouse and R. C. Woerner, assrs to Sinclair Refining Co. In the coking of hydrocarbon oils by contacting with fluidized coke particles, entrainment of coke fines in the overhead vapours is suppressed by tangentially injecting steam into the upper portion of the coking vessel, whereby a whirling motion is imposed on the stream of vapours rising from the body of coke particles prior to withdrawal overhead of the vapour stream.

U.S.P. 2,626,204 (29.1.49; 20.1.53). L. S. Kassel, assr to Universal Oil Products Co. Apparatus for conducting cat reactions comprising a vertical tubular cat container *A* in which a smaller tube *B* is concentrically disposed. *B* is divided by impervious partitions into a plurality of compartments, each of which has at one end $\lt 1$ opening in direct communication with the area immediately surrounding *B*, and at the opposite end $\lt 1$ radially disposed tube extending toward the wall of *A* and forming an open passageway from interior of *B* to a point adjacent the wall of *A*.

U.S.P. 2,626,247 (13.6.51; 20.1.53). H. M. Hart, assr to Standard Oil Co. In a system in which a fluidized dense phase of solids is maintained in a hopper *B* surmounting a column *A* to replenish the solids in *A*, a substantially constant pressure *P* is maintained at the base of *A* by introducing both air and steam as aeration gas into *B* and adjusting the rates of flow to obtain the desired *P*. Any deviation from *P* is counteracted either by holding the air rate constant and increasing or decreasing the steam rate in response to an increase or decrease, respectively, in *P*, or by holding the steam rate constant and increasing or decreasing the air rate in response to a decrease or increase, respectively, in *P*. V. P. P.

U.S.P. 2,637,633 (18.10.48; 5.5.53). E. Strunk, assr to Phillips Petroleum Co. Apparatus for stripping fluidized cat.

U.S.P. 2,638,453 (23.9.49; 12.5.53). C. E. Starr and J. P. Bilisoly, assrs to Standard Oil Development Co. Silica–alumina cracking cat is revivified by treatment with an alkaline earth metal fluoride.

U.S.P. 2,639,215 (11.10.47; 19.5.53). R. E. Bland, assr to Houdry Process Corpn. The walls of vessels containing flowing granular solids are protected by maintaining static masses of the solids between the walls and the moving solids. This is accomplished by a plurality of narrow horizontal shelves at spaced intervals up the walls. J. M. S.

U.S.P. 2,648,638 (19.1.50; 11.8.53). F. P. Richter, assr to Socony-Vacuum Oil Co. The method for preparing a tellurium oxide-containing cat.

U.S.P. 2,648,639 (28.6.49; 11.8.53). R. B. Bennett, assr to Standard Oil Development Co. A cat composition adapted for dehydrogenating hydrocarbons, which comprises approx 20% by wt calcium manganate and approx 80% wt of aluminium oxide. D. A. R.

HYDROGENATION

181. Effect of pressure refining on quality of benzol products. W. Grothe. *Erdöl u. Kohle*, 1953, **6**, 450–4.—Cat pressure hydrogenation, at 350° C, of 95% benzol gives 98% yield, comparison with the acid-refined product shows an increase (7·5% as against *ca* 3%) of aromatics with b.p. >150° C. Blending O.N. (F_1) is better for the pressure raffinate, gum is less, material is almost S free and has good Pb sensitivity. Detailed analysis was made of the non-aromatic component (2·7 vol %) of pressure raffinate, mainly arising from hydrogenation of olefins in feed. Careful fractionation enables pure benzene (m.p. 5·4° C) to be obtained from pressure raffinate (*cf* Abs. 1868 of 1951). V. B.

182. Patent. U.S.P. 2,626,286 (28.12.49; 20.1.53). A. Voorhies and C. E. Adams, assrs to Standard Oil Development Co. Simultaneous dehydrogenation of naphthenes to aromatics and hydrogenation of olefins to paraffins is effected by contacting a gaseous mixture of naphthenes and olefins with an activated carbon cat at 900°–1000° F. V. P. P.

POLYMERIZATION

183. Patents. U.S.P. 2,647,879 (18.4.50; 4.8.53). R. L. Sibley assr to Monsanto Chemical Co. Improving the flex resistance of butadiene-1 : 3 type polymers with mercaptans.

U.S.P. 2,647,883 (G.B. 13.1.49; 4.8.53). E. M. Evans and J. E. S. Whitney, assrs to British Resin Products Ltd. Copolymers of vinyl phenols with butadiene compounds.

U.S.P. 2,647,885 (28.9.51; 4.8.53). H. R. Billica, assr to E. I. du Pont de Nemours and Co. Production of polyethylene terephthalate using antimony trioxide as polymerization cat.

U.S.P. 2,647,886 (15.5.51; 4.8.53). R. B. Seymour, assr to Monsanto Chemical Co. Water-soluble heteropolymers from styrene, maleic anhydride, and a cross-linking reactant.

U.S.P. 2,647,887 (Netherlands 29.12.48; 4.8.53). J. M. Goppel, assr to Shell Development Co. The stabilization of sulphur dioxide–rubbery polymer products with free sulphur.

U.S.P. 2,648,644 (26.4.50; 11.8.53). F. M. McMillan and De L. E. Winkler, assrs to Shell Development Co. A softened rubber composition made up in the ratio of 100 parts rubber to from 2 to 20 parts of a softener composition comprising from *ca* 1–25% of an aromatic carboxylic acid together with at least 25% of an aromatic petroleum fraction, and from 0 to 50% of a natural petroleum oil.

U.S.P. 2,649,425 (24.11.48; 18.8.53). G. E. Hulse, assr to Hercules Powder Co. A pressure-sensitive adhesive comprising a solvent-soluble butadiene–styrene copolymer.

U.S.P. 2,649,428 (23.3.50; 18.8.53). D. W. Moore and A. H. Searl, assrs to Armstrong Cork Co. A mastic tile composition comprising *ca* 60–80% by wt of a filler and *ca* 40–20% by wt of a binder containing coumarone–indene resin, the resin being plasticized with a plasticizer containing *ca* 0·02% to *ca* 2% by wt thereof of at least one primary aliphatic amino compound containing at least 6 carbon atoms.

U.S.P. 2,649,429 (30.1.51; 18.8.53). J. R. Little, assr to United States Rubber Co. A method of vulcanizing synthetic rubber containing at least 25% of an aliphatic conjugated diolefin.

U.S.P. 2,639,430 (30.1.51; 18.8.51). J. R. Little, assr to United States Rubber Co. A method of vulcanizing synthetic rubber containing at least 25% of an aliphatic conjugated diolefin.

U.S.P. 2,649,431 (5.3.51; 18.8.53). J. R. Little, assr to United States Rubber Co. A method of vulcanizing synthetic rubber containing at least 25% of an aliphatic conjugated diolefin.

U.S.P. 2,649,432 (5.3.51; 18.8.53). J. R. Little, assr to United States Rubber Co. A method of vulcanizing synthetic rubber containing at least 25% of an aliphatic conjugated diolefin.

U.S.P. 2,649,437 (15.11.49; 18.8.53). P. O. Tawney, assr to United States Rubber Co. Soluble, fusible, convertible, unsaturated interpolymers of selected di-2-alkenyl citraconates or mesaconates and selected 2-alkenyl alcohols or chlorides.

Ger.P. 876,990, 2.4.53. — Otto, Ludwigshafen (Rhein), assr to BASF, Ludwigshafen (Rhein). Process for polymerization of propylene.

Ger.P. 876,991, 2.4.53. — Baumeister, — Heidelberg, and — Flemming, Hermeskeil, assrs to BASF, Ludwigshafen (Rhein). Process for converting olefins into valuable oily or higher-mol products by polymerization.
BrennstChemie, 1953, **34** (9–10). R. T.

CHEMICAL AND PHYSICAL REFINING

184. Patent. Ger.P. 876,836, 2.4.53. — Hoss, — Arras, and — Möbus, Frankfurt (M), assrs to Metallges A.G. Frankfurt (Main). Method for elec pretreatment of gas for mechanical separation from suspended particles by scrubbing.
BrennstChemie, 1953, **34** (9–10). R. T.

SPECIAL PROCESSES

185. Measurement of fluidization quality. W. W. Shuster and P. Kislick. *Chem. Engng Progr.*, Sept. 1952, **48** (9), 455–8.—The development of fluidization techniques has created a need for an instrument to measure the quality of fluidization in a fluidized bed. Following a consideration of the flow in a fluidization unit, details are presented of an instrument developed which measured the pressure fluctuations by recording the strain produced in a metal diaphragm by the pressure differences occurring across the section of a bed. The meter has been tested on fluidized beds of glass beads under varying conditions, and records so obtained have been confirmed by visual observation. J. G. H.

186. Patents. U.S.P. 2,647,875 (11.5.44; 4.8.53). M. M. Marisic, assr to Socony-Vacuum Oil Co. A process for preparing spheroids of inorganic oxide hydrogel.

U.S.P. 2,647,914 (G.B. 24.7.50; 4.8.53). W. G. Allan and T. J. Tobin, assrs to I.C.I. Ltd. A process for the continuous production of *iso*propyl nitrate by the continuous dist of a mixture of easily volatile products from a boiling reaction mixture formed from nitric acid and *iso*propyl alcohol, and into which separate streams of nitric acid and *iso*propyl alcohol are introduced and in which a urea concn effective to destroy nitrous acid is maintained, characterized in that there is passed through the boiling reaction mixture undergoing continuous dist a stream of a gas chemically indifferent to it.

U.S.P. 2,647,925 (10.4.51; 4.8.53). E. E. Gilbert and S. L. Giolito, assrs to Allied Chemical and Dye Corpn. A process for preparing monosulphonates of saturated aliphatic dicarboxylic acids.

U.S.P. 2,647,931 (29.6.49; 4.8.53). R. C. Wackher and C. B. Linn, assrs to Universal Oil Products Co. Reacting a phenolic compound containing a substitutable hydrogen atom

attached to the ring with a compound capable of yielding a hydrocarbon radical at condensation conditions in the presence of a cat comprising a solid oxygen-containing complex formed by heating oxygen, boron trifluoride, and a hydrocarbon at a temp above *ca* 150° C.

U.S.P. 2,649,463 (30.9.49; 18.8.53). J. F. Skelly, assr to M. W. Kellogg Co. A process for the production of olefin oxides which comprises forming an olefin–metal halide co-ordination compound and oxidizing the co-ordination compound.

U.S.P. 2,649,483 (25.1.48; 18.8.53). M. E. Huscher, W. Long, and J. C. Moore, assrs to Dow Chemical Co. A trialkanolamine corresponding to the general formula

$$(HOCH_2CH_2—)_nN(CH_2—CHOHCH_3)_{3-n}$$

wherein n is a positive integer less than 3.

U.S.P. 2,649,485 (G.B. 18.1.49; 18.8.53). A. W. C. Taylor, D. G. Jones, and M. L. Allan, assrs to I.C.I. Ltd. A process for the production of methyl acetylene which comprises the step of subjecting at least one monohalogenated propylene in the vapour phase to decomposition at a temp of 850°–1050° C for a time of from 0·01–0·1 sec, calculated at standard temp and pressure.

U.S.P. 2,650,154 (29.6.49; 25.8.53). H. M. Anderson, assr to Tide Water Associated Oil Co. Production of sulphur from hydrogen sulphide.

U.S.P. 2,650,236 (17.4.51; 25.8.53). F. E. Condon and E. E. Burgoyne, assrs to Phillips Petroleum Co. A process for preparing a furan, which process comprises contacting, at a temp in the range 250°–500° C, a C_4 to C_{10} acetylenic diol with a cat consisting essentially of cobalt molybdate supported on porous alumina, the 2 hydroxyl groups of the diol being 3 carbon atoms remote from each other, and the triple bond being intermediate the 2 hydroxyl-substituted carbons, and recovering the furan as the chief product of the process.

D. A. R.

Ger.P. 872,942, 26.2.53. H. Weghofer, assr to Krupp Kohlechemie G.m.b.H., Wanne-Eickel. Process for sulph-oxidation of derivatives of saturated aliphatic or *cyclo*-aliphatic hydrocarbons containing oxygen.

Ger.P. 873,240, 26.2.54. H-H. Inhoffen and H. Eysenbach, assrs to Schering A.G., Berlin. Production of Vitamin A and compounds of similar chem structure.

Ger.P. 873,241, 26.2.53. Les Laboratoires Français de Chimiothérapie, A. Girard, and G. Sandulesco. Production of testosterone esters or of testosterone. (Addn to Pat. 862,447.)

Ger.P. 873,242, 26.2.53. H. Herloff, assr to Schering A.G., Berlin. Production of estronediol or its derivatives.

Ger.P. 873,086, 26.2.53. O. Grosskinsky and J. Karwell, assrs to Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik G.m.b.H. Production of oxidn products of fossil or recent fuels.

BrennstChemie, 1953, **34** (7–8).

Ger.P. 876,403, 2.4.53. — Wenzel, Frankfurt (Main), assr to BASF, Ludwigshafen (Rhein). Method for producing ethers.

Ger.P. 876,841, 2.4.53. Leverkusen-Bayerwerk, assr to Chemische Verwertungsges. m.b.H. Oberhausen-Holten. Method for producing org compounds containing O_2.

Ger.P. 876,842, 2.4.53. — Gemassmer, Köln-Stammhein, assr to Chemische Verwertungsges. m.b.H. Oberhausen-Holten. Method for producing org compounds containing O_2.

Ger.P. 876,995, 2.4.53. — Wenzel, Frankfurt (Main) and — Gemassmer, Köln-Stammhein, assrs to Chemische Verwertungsges. m.b.H. Oberhausen-Holten. Method for producing org compounds containing O_2.

Ger.P. 876,844, 2.4.53. — Flemming, — Hermeskeil, and — Woerner, Ludwigshafen (Rhein), assrs to BASF, Ludwigshafen (Rhein). Method for producing alkali salts of carboxylic acids, if necessary, mixed with alcohols.

Ger.P. 876,996, 2.4.53. Mannes, Düsseldorf-Benrath, assr to Henkel & Cie G.m.b.H. Method for producing alkali or alkaline earth salts of aliphatic dicarboxylic acids or the corresponding free acids.

Ger.P. 876,998, 2.4.53. — Francke, Marl Weissbach, Marl and Seemann, Marl, assrs to Chemische Werke Hüls G.m.b.H., Marl (Kr. Recklinghausen). Methods for producing alcohols of the acetylene series.

Ger.P. 876,733, 2.4.53. Farbenfabriken Bayer, Leverkusen-Bayerwerk. Method for producing an acid-free soft soap-type detergent.

Ger.P. 876,840, 2.4.53. BASF, Ludwigshafen (Rhein). Method for producing saturated aliphatic halogen compounds.

BrennstChemie, 1953, **34** (9–10). R. T.

PRODUCTS

CHEMISTRY AND PHYSICS

187. Volumetric behaviour and thermodynamic properties of ethylene oxide. C. J. Walters and J. M. Smith. *Chem. Engng Progr.*, July 1952, **48** (7), 337–43.—The volume of ethylene oxide in the vapour and saturated liq regions has been measured in a compressibility bomb from 14·7 to 600 lb/sq. in. abs over a temp range of 70°–310° F. Additional data were taken in the critical region, and polymerization at temp above 220° F was so rapid as to require measurements as a function of time. At 310° F the volume decrease was 0·4% per hour. Based on tests with other substances, inaccuracy of the volumetric data for ethylene oxide is believed to be less than 0·3% below 310° F and less than 1% above 310° F. The apparatus and method used are described in detail, and the data so obtained are combined with available spectroscopic information to determine enthalpy and entropy values in the two-phase and gaseous regions. Results are shown in graphical and tabular form. J. G. H.

188. Specific heats of tars and tar products. E. Edler. *Erdöl u. Kohle*, 1953, **6**, 543–6.—Previous expressions for sp. ht. of tars, etc., are critically reviewed. General equation $C_t = 1/d_{15}\,(A - Bt)$ can be applied to wide range of tars, etc., by choice of suitable const, which are given; results have error <5% and, except for pyridine bases and hydrogenated phenols, <4%. Experimental (literature) values for 93 products are graphed, and curves and nomogram for calc sp. ht. given. Integration of above equation gives enthalpy, this is depicted in curves covering wide temp range (from −40° C for light oil to 550° C for hard tars) enabling heat contents to be obtained more accurately than by use of mean sp. ht. V. B.

189. Patents. U.S.P. 2,634,291 (13.11.51; 7.4.53). P. M. Arnold, assr to Phillips Petroleum Co. An alkyl sulphenyl trithiocarbonate having the general formula $S=C\begin{matrix}SSR\\SSR\end{matrix}$ wherein R is a primary or secondary alkyl radical having no more than 12 carbon atoms.

U.S.P. 2,634,296 (27.12.49; 7.4.53). R. C. Morris and J. L. Van Winkle, assrs to Shell Development Co. The method of preparing a β-aryl monoether of glycerol which comprises heating the corresponding aryl ether of glycerol αγ-dichlorohydrin in admixture with a soln in water of a salt of a strong alkali and a non-gaseous acid characterized by a pKa value for the acid within the range of from *ca* pKa 6·5 to *ca* pKa 3·5 in an amount so as to buffer the soln during reaction to an acidity represented by a pH value not less than *ca* 2·5 and not greater than *ca* 6·0, and continuing the heating until the β-aryl mono-ether of glycerol is formed.

D. A. R.

ANALYSIS AND TESTING

190. Estimation of heat of combustion of light petroleum products. S. Patzau. *Bull. Polish Inst. Petrol.*, 1953, **3**, 2.—Experiment using bomb calorimeter in which product was sealed in a glass bulb showed drawbacks due to loss of volatile portions whilst sealing and occasional failures to break the glass bulb. Open vessels made of quartz produced low results due to incomplete combustion. Stainless steel vessels catalysed oxidn, and results were good. To obtain more accurate results Zubov's method used in the U.S.S.R. was employed. Sample is put into stainless steel or Pt vessel covered over with collodion of known cal. val. Very good results were obtained, and were up to 1% higher than without collodion membrane. Since operations external to the bomb take approx 30 sec, losses due to evaporation are ruled out. It seems most likely that in the time when the bomb is filled with oxygen under pressure the hydrocarbon absorbs oxygen, and on ignition the heat of combustion is therefore lower. This seems to be borne out also by the excessively low figures if sample has been blown out of combustion vessel by inrushing oxygen. Exact measurements confirm Cragoe's formulæ: (1) $Q_H = 12\,400 - 2\,100d^2$; (2) $Q_L = 2394 + 0{\cdot}7195\ Q_H$, using $L.Ht.H_2O = 563{\cdot}2$ cal/g; or (2*a*) $Q_L = 2551 + 0{\cdot}7012Q_H$, using $L.Ht.H_2O = 600$ cal/g. M. S.

191. Rapid determination of tetra-ethyl lead with Komplexon. A. Grünwald. *Erdöl u. Kohle*, 1953, **6**, 550–1.—20–50 ml gasoline treated with excess Br (30% in CCl_4). Add sufficient EtOH to make soln homogeneous and dissolve ppt. Boil, add alc N KOH to destroy excess Br + few ml excess. Add 100–200 ml H_2O, reflux 5 min, if acid to methyl red add more alc KOH and repeat refluxing. Add excess Komplexon III soln (di Na salt of ethylenediamine tetra-acetic acid) acidify with dil H_2SO_4 and neutralize to methyl red. Add 10 ml buffer soln (54 g NH_4Cl, 350 ml 25% NH_4OH made up to 1 l) and Eriochrom black T indicator. Titrate with $ZnSO_4$ (green blue to violet). Komplexon and $ZnSO_4$ solns must be equimolar. TEL (ml/l) $= 3{\cdot}489\ \frac{K - Z}{B}$ (K = ml Komplexon, Z = ml $ZnSO_4$, B = ml gasoline). EtOH, C_6H_6, unsaturateds, monomethylaniline do not interfere. Test takes 15 min. V. B.

192. Rheology of disperse systems. II. A suitable absolute rheometer of the Couette type. K. H. Grodde. *Erdöl u. Kohle*, 1953, **6**, 457–9 (*cf.* Abs. 2041 of 1953).—Construction and operation of co-axial cyl type of instrument, primarily intended for examination of drilling muds is described. Inter-cyl distance is 1 mm and liq capacity 50 ml. Range covered is shear stress 10–10,000 dyn/cm², visc (in case of Newtonian liq) 0·005–5,000 poises; average error approx 2%. V. B.

193. Speedy, accurate hydrogen measurement. R. B. Jacobs and L. G. Lewis. *Oil Gas J.*, 28.9.53, **52** (21), 128.—A new instrument, developed by Standard Oil Co, Indiana, which uses β-rays for rapid determination of percentage of hydrogen in liq hydrocarbons is described. G. A. C.

194. Problems in hydrocarbon extraction. I. D. L. Katz, R. H. Schatz, and B. Williams. *Oil Gas J.*, 28.9.53, **52** (21), 118.—Pt 1 of a University of Michigan report on data available for "deep" extraction of ethane and propane. This includes data on vapour–liq equilibria, densities, visc, and thermal properties in low temp region. G. A. C.

195. Testing of extreme pressure gear lubricants. W. B. Bassett and F. F. Musgrave. *Erdöl u. Kohle*, 1953, **6**, 547–50.—Operation of Timken, SAE, Falex, Almen, and 4-ball testers is described, all these show poor repeatability. Requirements of U.S. spec Mil-L-2105 are listed and discussed, photographs of test pieces from full-scale axle trials are reproduced. Comparative table of results of such full-scale tests (based on 300 trials) and of above-mentioned laboratory testers show complete unreliability of latter for assessing E.P. gear lubricants. V. B.

196. Structural group analysis of petroleum fractions by the n-d-M method. J. J. Leendertse *et al. Erdöl u. Kohle*, 1953, **6**, 537–42.—Description of method, its applicability, and comparison with other methods of structural group analysis. Data given have been previously published in book form by 2 of the present authors (*cf. J. Inst. Petrol.*, 1951, 288A). V. B.

197. Gas analysis using mass spectrograph. W. Zuk. *Nafta (Krakow)*, 1952, **8**, 206–8, 238–40.—The construction and working of Aston's Mass Spectrograph is explained. 3 samples of mixed hydrocarbons are analysed as an illustration. Presence of CO_2, N_2, and O_2 interferes, giving peaks indistinguishable from some hydrocarbons. M. S.

198. Asphalt analysis. R. N. Traxler and H. E. Schweyer. *Oil Gas J.*, 28.9.53, **52** (21), 143; 12.10.53, **52** (23), 166.—Pt 3 in this series in the Refiner's Notebook gives a table showing that the order of treatment of the asphalts with the solvents is immaterial, although the initial deasphalting step with *n*-butanol is preferred. Use of refractive index determination is also discussed.

Method of determination of refractive index of asphaltic materials is given, together with a table showing index data. G. A. C.

GAS

199. Polish natural gas industry avails itself of experience of U.S.S.R. — Drzewiecki. *Nafta (Krakow)*, 1952, **8**, 292–5.—Many problems facing the Polish natural gas industry are capable of a solution found by Soviet industry. Gas production has more than doubled itself between 1945 and 1952, and will double itself again by 1955. With rich resources, as yet uncovered, progress is certain. Pipeline to Warsaw was completed in 1951. Auxiliary pumping equipment is necessary to maintain driving pressure as well as gas-holders along the line. Natural gas can also be used as chemical raw material and motor fuel. M. S.

200. Soot formation and kinetics of turbulent diffusion flames. H. Behrens. *BrennstChemie*, 1953, **34** (9–10), 135–7.—A comprehensive study of the kinetics of premixed and diffusion flames and of turbulent diffusion flames, which occupy an intermediate position. Combustion phenomena in the soot-furnace are discussed; the composition of the reaction products, CO, H_2, N_2, and H_2O indicates that equilibrium is not established. The undesirable soot formation in the production of synthesis gas and C_2H_2 by the combustion of CH_4 is opposed, and the process made possible, by spraying in a solution of Ni salts. R. T.

GAS OIL AND FUEL OIL

201. The effect of metal oxide smokes on the SO_3 content of combustion gases from fuel oils. D. Flint, A. W. Linsay, and R. F. Littlejohn. *J. Inst. Fuel*, Sept. 1953, **26** (152), 122.—The first part of the article is concerned with the effect of fuel and combustion conditions on acid dew-point and the rate of acid build-up on the dew-point element. The second and larger part of the article describes the tests carried out to determine the effect of additives, *e.g.*, soda residue, calcium residue, and commercial zinc naphthenate, to the fuel being burnt as a means of reducing the SO_3 concn. Measurements were made with a dew-point meter on 3 oil-fired appliances—an "Ideal" sectional boiler, a "Britannia" sectional boiler, and a small refractory furnace. Tests made on the boilers were brief, and the bulk of the work was carried out on the refractory furnace. 5 fuels were tested, varying from a heavy fuel oil (3·5% S) to a gas oil (0·75% S). The heavy fuel oil was selected for the additive tests, and measurements on the gases produced by it showed that only commercial zinc naphthenate was successful in decreasing appreciably the amount of SO_3 in the combustion gases. D. K.

LUBRICANTS

202. Bearings, lubricants, and lubrication. A digest of 1952 literature. Anon. *Mech. Engng., N.Y.*, Oct. 1953, **75** (10), 801.—Subjects covered are: ball and roller bearings, thrust

bearings, automotive lubricants, gear lubrication, metal working lubrication, boundary lubrication and friction, and properties of lubricants. 124 refs. T. T.

203. The dry lubrication of moving parts. P. H. Billington. *Mech. World*, Oct. 1953, **133** (3411), 468.—The use of colloidal graphite dispersions is considered for lubrication problems beyond the range of conventional lubricants. This type of lubricant can be employed at temp at which oils and greases would be burnt away, and also where high pressures would result in the extrusion of conventional lubricants. Applications of colloidal graphite lubrication, both dry and in a carrier liq, are discussed. Methods of applying dispersions are given. T. T.

204. Surface-active lubricants. M. Kühn. *Erdöl u. Kohle*, 1953, **6**, 455–6.—Conditions governing boundary lubrication are discussed. Many E.P. additives contain phosphoric esters, which at high temp decomp to yield phosphoric acid, which forms a plastic phosphate layer on metal. Lubrication of 2-stroke engines is considered to be an example of boundary lubrication, since lubricating action is not due to lub oil dissolved in fuel but to oxidn products of such lub oil. Extreme case of boundary lubrication occurs in wire drawing; use of borax causes formation of Na–Fe–B glass, which is plastic at temp (*ca* 1000° C) occurring in die. V. B.

205. Lubrication characteristics of synthetic lubricants at high sliding velocities. R. L. Johnson, M. A. Swikert, and E. D. Bisson. *Lubric. Engng*, June 1953, **9** (3), 144–9.—As the friction and surface failure properties of the lubricants needed to meet the requirements of aircraft turbine engines are of extreme importance, the boundary lubrication characteristics of several classes of synthetic lubricants over a wide range of sliding velocities were studied at the NACA laboratories, and the results are reported here. It was found that most uninhibited synthetics are more effective boundary lubricants at high sliding velocities than petroleum oils of comparable visc at 100° F and that the breakdown of effective lubrication takes place at a much higher sliding velocity than with petroleum oils. A silicone–diester blend proved to be a much more effective boundary lubricant at high sliding velocities than either the silicone or the diester. A diester failed to lubricate non-reactive surfaces, indicating that the lubrication mechanism for diesters may involve chemical reaction with the lubricated surfaces. J. G. H.

206. Reduction of gear failures. S. D. Craine. *Lubric. Engng*, April 1953, **9** (2), 70–2, 98–9.—While under present conditions gears are so designed as to last out the life of the machinery of which they constitute a part, gear failures can be attributed to one of 7 causes, misalignment, vibration and shocks, improper lubrication, improper material or heat treatment, improper gear, bearing or housing design, and excessive loading. The early indications of failure by these causes are summarized, and recommendations for the correction of the faulty conditions are put forward. It is suggested that the lubrication engineer, by reason of his continued and close contact with the equipment, is in a position to recognise early symptoms of failure and to initiate action for its elimination. J. G. H.

207. Flow of lubricating grease between parallel planes. L. C. Brunstrum and H. M. Grubb. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, May 1953, **XVII** (2), 8–16.—Difficulties encountered in obtaining consistent measurements of the visc of lubricating greases are discussed, and a comparison is reported of the visc of several conventional greases measured in the ASTM viscometer with the usual cyl capillaries and with special capillaries of rectangular cross-section, which are so proportioned as to approximate to flow conditions between infinite parallel planes. It is suggested that the use of rectangular capillaries may result in more accurate visc determinations, particularly at higher shear rates. J. G. H.

208. Thixotropy of lubricating greases. B. W. Hotten and B. B. Farrington. *Bull. Amer. Soc. Test. Mat.*, April 1953, **189**, 53–6.—A new worker-penetrometer test developed for the measurement of thixotropy of lubricating greases is described. Shear softening and age stiffening are measured separately, the former by the slope of a straight line obtained when penetration is plotted against log ASTM grease worker strokes, the latter by the slope of the straight line obtained when penetration is plotted against ageing time after the grease has been worked 3000 strokes. Typical lithium, sodium, calcium, barium, and aluminium soap greases were measured by the method, and a wide variety in magnitude and extent of reversibility of thixotropic properties was shown. Reproducibility of the test was found to be good. J. G. H.

209. A new method of testing of oxidation stability of lubricating oils. H. Mosurski. *Nafta (Krakow)*, 1952, **8**, 186–8.—The new method consists of circulating a quantity of lub oil (150 gm) at the rate of 0·7 gm/minute (±2%) over a steel plate inclined at 15° heated to 250° C (±2° C) for 12 hr whilst any vapour is collected by suction. All oil is recovered, and then carbon (Conradson) ash and oxygenation analyses are made. As example of the working of this method, several results are tabulated and compared with other methods. Repeatability of this method is *ca* 20%, but it allows the operator to distinguish between oils with or without antioxidants, because instead of redistribution of oxygen between acids, esters, and carbonyls, the new method shows a fall in oxidn of oil to all 3 kinds of oxygenated products.

This new method is considered superior. M. S.

210. Patents. U.S.P. 2,624,707 (7.6.49; 6.1.53). G. G. Pritzker and D. E. Adelson, assrs to Shell Development Co. Oleaginous base containing a product obtained by heating under reflux a phosphorus sulphide with thiophene, benzthiazole, or an α : α-dipyridyl compound in mole ratio 1 : 5 to 2 : 1 respectively, to prevent deterioration and impart E.P. properties.

U.S.P. 2,625,509 (20.3.50; 13.1.53). E. Laug, assr to Socony-Vacuum Oil Co. Cutting fluid and coolant consisting of, in wt %, potassium soaps of castor oil fatty acids 17 to 20, triethanolamine soaps of castor oil fatty acids 2 to 5, triethanolamine phosphate 8 to 13, water soluble polyalkylene glycols 3 to 5, rust inhibiting sodium salt 2·25 to 4, phenol germicide 1 to 1·5, and balance water.

U.S.P. 2,626,240 (25.6.49; 20.1.53). A. J. Deutser and F. T. Crookshank, assrs to Texas Co. Sol oil comprising as the major constituent sulphurized mineral lub oil containing loosely combined active sulphur, an emulsifying agent forming oil-in-water type emulsions, a high b.p. liq coupling agent and 0·2–2·0 wt %, based on sol oil, of an aromatic alkylene diamine (benzyl alkylene diamines, salicylal alkylene diamines) sufficient to inhibit corrosion of steel in presence of water.

U.S.P. 2,626,242 (25.10.48; 20.1.53). S. K. Talley and F. J. Watson, assrs to Shell Development Co. Torque converter fluid consisting of a mixture of tertiary alkylated naphthalenes, having 1 to 4 alkyl radicals per mol and an average VI of −50 to −400, at least 90% boiling at 200°–500° C/760 mm.

U.S.P. 2,625,508 (13.2.51; 13.1.53). F. H. Stross, assr to Shell Development Co. Water resistant grease comprising a lub oil base gelled with an anhydrous preferentially water wettable inorganic gel and waterproofed with a hydrophobic metallic soap of a soap-forming organic acid.

U.S.P. 2,625,510 (25.10.51; 13.1.53). R. J. Moore, assr to Shell Development Co. Stabilized grease comprising a mineral oil of VI >40 thickened with a soap and 1–20 wt % of an oxidized pet aromatic extract obtained from a pet dist of visc 60 SUS/210° F, the extract having an aniline point 25°–75° C, and the oxidn being effected by exposing the extract and the grease forming components to air at 175°–410° F. V. P. P.

U.S.P. 2,638,445 (5.5.45; 12.5.53). D. W. Young, W. H. Smyers, and W. J. Sparks, assrs to Standard Oil Development Co. V.I. improvers for mineral lub oils are made by reacting 50 parts wt of high mol. wt. styrene–*iso*butylene copolymer with 15 parts wt of fuming sulphuric acid at 100° C and neutralizing with barium hydroxide.

U.S.P. 2,638,446 (19.5.50; 12.5.53). J. J. Wasson, assr to Standard Oil Development Co. Lubricant for pneumatic tools comprising a mineral lub oil having a visc of 50–500 S.S.U. at 100° F, degras, oil-soluble calcium pet sulphonate, sulphurized sperm oil, tricresyl phosphate, and polybutene.

U.S.P. 2,638,447 (8.2.50; 12.5.53). F. P. Otto, L. W. Manley, and R. V. White, assrs to Socony-Vacuum Oil Co. E. P. lubricant comprising a mineral lub oil and minor proportions of: (*a*) a product obtained by substituting a part of the chlorine in a chlorinated aliphatic compound with a thiocarbonate group, (*b*) dihydroabietyl malate, and (*c*) a product formed by reacting 3 mol of an alkylated phenol with 1 mol of phosphorus pentoxide at 75°–125° C.

U.S.P. 2,638,448 (14.2.50; 12.5.53). J. J. Wehrle, assr to Socony-Vacuum Oil Co. Antioxidants for mineral lub oils made by reacting an alkanethiol or aliphatic alcohol of 6–24 carbon atoms with a phosphorus halide and reacting the product with a thiophenethiol.

U.S.P. 2,639,266 (7.4.51; 19.5.53). J. P. Dilworth and C. H. Culnane, assrs to Texas Co. Lubricating grease comprising a mineral lub oil, a complex polyester obtained by reacting a polypropylene glycol of 6–9 carbon atoms with sebacic acid and 2-ethylhexanol, sodium myristate, N : N′-diphenyl-*p*-phenylenediamine, and tricresyl phosphate.

U.S.P. 2,639,288 (23.4.52; 19.5.53). A. Bell and D. J. Shields, assrs to Eastman Kodak Co. 2 : 5-Dihydroxyphenyl dimethyl carbinol and related compounds are antioxidants for oils and fats.

U.S.P. 2,640,030 (1.3.51; 26.5.53). F. B. Fischl and M. W. Hill, assrs to Standard Oil Development Co. E.P. additive composition for lub oils consisting of a mineral lub oil of 50–250 S.S.U. visc at 210° F treated with a phosphorus sulphide at 375°–475° F and further treated with a sulphurized fatty oil or lower alcohol ester thereof at 250°–450° F.
J. M. S.

U.S.P. 2,640,811 (26.3.51; 2.6.53). H. S. Baretvas, assr to Standard Oil Co, Chicago. Lub composition resistant to the formation of stable emulsions with water comprising a major proportion of a hydrocarbon lub oil and the following constituents in the approx wt %: oil sol lead soap 3–20; organic sulphur containing E.P. agent 3–20; $C_{<13}$ fatty acid 0–10; asphalt 1–25; solvent extract of hydrocarbon oil 0–25; oil-sol alkaline earth sulphonate 0·25–3; sulphated castor oil 0·25–2. The E.P. agent is a sulphurized-fat, -fatty acid, -ester, -vegetable oil, or -olefin; the solvent extract contains aromatic and/or polynuclear naphthenic compounds.

U.S.P. 2,641,578 (16.3.50; 9.6.53). C. A. Weisel, assr to Standard Oil Development Co. Mineral lub oil containing in soln 0·01–10% of a salt of pentachlorophenol and a $C_{<8}$ aliphatic or cycloaliphatic amine.

U.S.P. 2,625,452 (14.3.49; 13.1.53). J. Haller. Porous bearing of sintered metal containing a lubricant reservoir.

U.S.P. 2,640,812 (8.3.51; 2.6.53). W. C. Bryant, assr to Swan-Finch Oil Corpn. Grease composition comprising a pet lubricant, a montmorillonite modified by an organic cation *A*, and a Li, Na, Ca, Ba, or Sr organic salt gelator *B* containing a straight $C_{<8}$ chain to improve lubricity and inhibit corrosivity of *A*, *A* : *B* being 19–78 : 81–22%.

U.S.P. 2,641,577 (22.6.51; 9.6.53). R. O'Halloran, assr to Standard Oil Development Co. Grease composition comprising a lub oil thickened with a mixture of lithium and calcium soaps of an unsubstituted saturated high mol. wt. saponifiable material in ratio Li soap : Ca soap of 6 : 1 to 3 : 1.
V. P. P.

Ger.P. 876,437, 2.4.53. Hofmann-Ottensen, assr to Deutsche Shell A.G., Hamburg. Method for producing high-pressure lubs.

BrennstChemie, 1953, **34** (9–10). R. T.

SPECIAL HYDROCARBON PRODUCTS

211. Patents. U.S.P. 2,626,876–7 (17.8.51; 27.1.53). J. J. Carnes, assr to American Cyanamid Co. Electrostatic charges on shaped articles of thermoplastic vinyl resin are inhibited by applying a volatile liq containing a compound of formula $R.CO.NH.CH_2.CH_2.CH_2.NR'R''R'''Y$. In (*a*), R = $C_{<7}$ aliphatic or alicyclic radical, R′ and R″ = C_{1-3} alkyl or hydroxyalkyl radical, R‴ = C_{1-3} hydroxyalkyl radical, Y = anion. In (*b*), R = $C_{<7}$ aliphatic hydrocarbon radical, R′ and R″ = C_{1-5} alkyl radical, R‴ = alkyl, alkenyl or aralkyl radical, Y = anion. The finished article contains 0·2–10% of the compound based on wt of dry, untreated article.

U.S.P. 2,624,725 (4.1.50; 6.1.53). J. A. Bjorksten and J. B. Eisen, assrs to Monsanto Chemical Co. Non-electrostatic composition consisting of a thermoplastic synthetic resin, an aliphatic monoamine with <6 C atoms in <1 radical attached to the nitrogen atom, and phosphoric, sulphuric, or sulphamic acid.

U.S.P. 2,624,680 (27.6.50; 6.1.53). D. Swern, assr to U.S.A. (Secretary of Agriculture). Cellulose esters and/or vinyl chloride–vinyl acetate copolymers plasticized with C_{1-4} alkyl C_{1-4} alkoxy stearates.

U.S.P. 2,625,533 (2.3.48; 13.1.53). F. J. Williams and J. G. Hendricks, assrs to National Lead Co. Heat stabilized P.V.C. containing 0·5–15% hydrous tribasic lead sulphate.

U.S.P. 2,625,521 (15.6.50; 13.1.53). W. F. Fischer and D. W. Young, assrs to Standard Oil Development Co. Composition comprising P.V.C., a neutral branched chain C_{7-13} alkyl ester of a polybasic acid and 0·01–5% by wt of P.V.C. of a bisphenol stabilizer of formula RXR′, wherein X is a 2 : 2-alkylidene group of 3–6 C atoms, a 3 : 3-alkylidene group of 5–7 C atoms, S or sulphoxide, and R and R′ are hydroxyphenyl radicals, or monochloro or C_{1-3} alkyl substituted hydroxyphenyl radicals.

U.S.P. 2,625,527 (4.5.49; 13.1.53). P. V. Smith and D. W. Young, assrs to Standard Oil Development Co. A resinous copolymer of 95% vinyl chloride and 5% vinyl acetate is plasticized with 30–60 parts of a neutral ester of phthalic acid esterified with OXO alcohols derived from C_7 olefins by reaction with CO and H_2 at 250°–470° F/150–400 atm and consisting of 25–40% of 2-methyl 3-ethyl pentanol-1 and 2-*iso*propylpentanol-1, 15–25% of 2-*iso*propyl 3-methyl butanol-1, 5–10% of 2 : 5-dimethyl hexanol-1, 5–10% of 3 : 4-dimethyl hexanol-1, 5–10% of 3 : 4 : 4-trimethyl pentanol-1, 0–15% of C_9 alcohols, and 0–15% of C_7 alcohols.

U.S.P. 2,624,716 (8.7.50; 6.1.53). M. K. Smith, assr to Baker Castor Oil Co. P.V.C., a copolymer containing 85–92 wt % vinyl chloride with vinyl acetate or a copolymer containing 95–99 wt % vinyl chloride with vinylidene chloride, is stabilized and plasticized by adding a linear polyester, mol. wt. 1700–8000, of branched chain structure obtained by reacting a dicarboxylic acid with a glycol or an aliphatic monoester of a trihydric alcohol, and an alkaline earth ricinoleate.

U.S.P. 2,626,968 (5.5.50; 27.1.53). I. L. Newell, assr to United Aircraft Corpn. Production of expanded plastics by heating a mixture of the plastic and an organic ammonium nitrite (di-*iso*-propyl-, di-*iso*butyl-, di-*cyclo*hexyl-, di-*n*-butyl-, diphenyl-, monophenyl-, monoethyl-, or tri-*n*-butyl-ammonium nitrite).

U.S.P. 2,624,718 (24.7.51; 6.1.53). I. I. Bezman and D. D. Browning, assrs to Armstrong Cork Co. Coating compositions are prepared by suspending P.V.C. or a copolymer containing <45% vinyl chloride in an org liq

medium including a plasticizer and diluent, and adding 0·1–5 wt % water to reduce the visc.

U.S.P. 2,625,522 (20.10.49; 13.1.53). A. C. Fischer and W. H. Walker, Walker assr to Fischer; W. C. Fischer and C. G. Fischer, executors of A. C. Fischer, deceased, assrs to Servicised Products Corpn. Sealing compound comprising, by wt, 26–35% of a polymerized vegetable oil, 35–45% of a coumarone–indene resin that is plastic at 0° F, 16–25% of a residual asphalt oil, and finely divided fillers.

U.S.P. 2,625,534 (13.6.50; 13.1.53). R. B. Thompson, assr to Universal Oil Products Co. Production of resins by heating the reaction product of a hydroxy aromatic aldehyde and ethyl mercaptan in presence of an acidic cat.

U.S.P. 2,626,285 (30.1.50; 20.1.53). W. D. Spaulding and B. K. Wasserkrug, assrs to National Steel Corpn. *cyclo*-Pentadiene *A* is recovered from coke oven by-product light oil fractions by maintaining the fractions at 302°–527° F/*ca* atm pressure to dimerize *A* and cooling the product to 115°–338° F to condense the dimer.

U.S.P. 2,626,236 (8.2.49; 20.1.53). B. F. Tatterson, assr to Koppers Co. In purification of naphthalene by treatment with sodium followed by dist to leave a solid residue *A*, *A* is converted to a flowable liq by refluxing with the aq condensate obtained by feeding steam into the space of the still above *A*.

U.S.P. 2,625,491 (29.12.49; 13.1.53). D. W. Young and P. V. Smith, assrs to Standard Oil Development Co. Colourless pet wax is stabilized to heat with 0·01–1% of 2 : 6-di-*tert*-butyl-4-methyl phenol, and to light with 0·01–1% of polyethylene glycol di- or tri-ricinoleate.

U.S.P. 2,625,489 (13.4.49; 13.1.53). P. J. Keating, assr to Texas Co. A wet concrete mix producing on hardening a concrete of increased resistance to freezing and thawing, comprising Portland cement, aggregate, and a paraffin wax emulsion formed by mixing water with a wax–soap mixture obtained by oxidizing paraffin wax to a product having a sap val *ca* 93, a neut No *ca* 41, and saponifying the product with alkali metal hydroxide. The wax emulsion constitutes 0·005–0·014% by wt of the Portland cement.

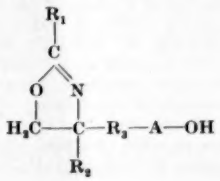
U.S.P. 2,625,540 (18.8.47; 13.1.53). C. C. Crawford, assr to Phillips Petroleum Co. Wood rosin is refined by dissolving 1 part of rosin in 1–20 parts by wt of a highly branched paraffin hydrocarbon solvent obtained by alkylating *iso*butane with butene and having b.p. 205°–235° F, an. pt >165° F and kauri butanol val <30, and extracting colour bodies from the soln with furfural.

U.S.P. 2,626,887 (3.5.49; 27.1.53). J. C. Ambelang, assr to Firestone Tire and Rubber Co. Rayon tyre cord comprises rayon filaments which, when freshly formed, were treated with a dil aq suspension containing 0·4–1·0 wt % of a finish consisting of equal parts of a mineral oil and a polyalkene oxide of mol. wt. 1000–10,000, and a relatively small proportion of an alkali metal alkarylsulphonate containing <8 alkyl carbon atoms in the mol.

U.S.P. 2,624,719 (31.3.50; 6.1.53). A. F. Roche and R. M. Price, assrs to Dow Chemical Co. Heat stabilized moulding composition comprising a thermoplastic monovinyl aromatic polymer and 0·04–3 wt % of an aliphatic secondary alcohol or an ether alcohol composed of C, H, and O atoms, having a mol. wt. <300 and containing OH attached to a *sec*-C atom.

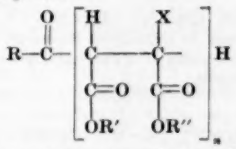
V. P. P.

U.S.P. 2,636,038 (18.5.51; 21.4.53). J. D. Brandner, assr to Atlas Powder Co. A compound conforming to the structural formula:



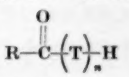
wherein R_1 is an aliphatic hydrocarbon radical of from 7 to 17 carbon atoms, R_2 is hydrogen or methyl, R_3 is an aklylene radical containing not more than 2 carbon atoms, and A contains from 2 to 20 oxyalkylene groups and is an oxyethylene radical, or an oxypropylene radical, or a mixture of oxyethylene and oxypropylene radicals.

U.S.P. 2,647,920 (9.12.50; 4.8.53). T. M. Patrick, Jr., and E. W. Gluesenkamp, assrs to Monsanto Chemical Co. The telomeric composition

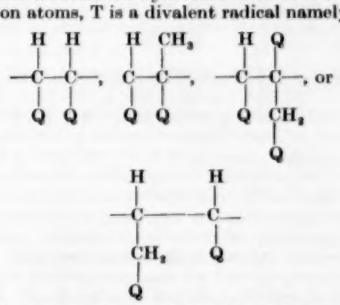


wherein R is a saturated hydrocarbon radical containing up to 17 carbon atoms, R′ and R″ are alkyl radicals containing up to 18 carbon atoms, X is —H or $-CH_3$, and *n* is an integer from 2 to 20.

U.S.P. 2,647,921 (9.12.50; 4.8.53). T. M. Patrick, Jr., assr to Monsanto Chemical Co. The telomeric composition



wherein R is a saturated hydrocarbon radical containing up to 17 carbon atoms, T is a divalent radical namely



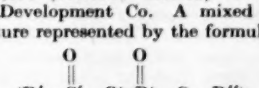
wherein Q is the radical —COOR′ and R′ is a saturated carbocyclic hydrocarbon radical, free from non-benzenoid unsaturation, containing up to 20 carbon atoms, and *n* is an integer from 2 to 20.

U.S.P. 2,648,612 (19.2.52; 11.8.53). I. G. Cooper. A plastic sealing composition wherein the ingredients have the following proportions: (1) paraffin, 13–19 pts by wt; (2) paraffin oil, 5–7 pts by vol; (3) wood flour, 4–10 pts by wt; (4) soap and borax in equal amounts, not to exceed 1% of the composition by wt.

U.S.P. 2,648,695 (25.7.49; 11.8.53). C. W. Smith, assr to Shell Development Co. A chemical compound having a structure represented by the structural formula

in which R′ is hydrogen or hydrocarbon and R represents a divalent saturated hydrocarbon radical having the 2 free valencies located on different carbon atoms which are separated from each other by not less than one and not more than 2 intervening carbon atoms, the free valencies being satisfied by union with the respective atoms designated in the structural formula by P and by O.

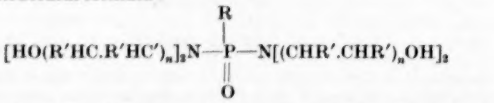
U.S.P. 2,648,696 (19.6.51; 11.8.53). R. R. Whetstone, assr to Shell Development Co. A mixed acid anhydride having a structure represented by the formula



in which

signifies the acyl residue of an aromatic carbocyclic monocarboxylic acid, —O—R'' signifies the residue of an aliphatic monohydric alcohol denoted by R''OH, m signifies a whole number having a value of not less than one or greater than 3, and $n = 3 - m$.

U.S.P. 2,648,706 (29.9.50; 11.8.53). A. H. Lewis and R. D. Stayner, assrs to California Research Corpn. As new wettting agents, diamides of alkane phosphonic acids, having the structural formula:



wherein R is a long-chain alkyl radical having from 10 to 20 carbon atoms, R' is hydrogen or a methyl radical, and N is 1 or 2. D. A. R.

DERIVED CHEMICAL PRODUCTS

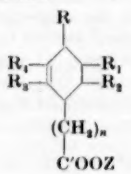
212. Production of petrochemicals at Hüls chemical factory. Anon. *Erdöl u. Kohle*, 1953, **6**, 497–9.—Hüls factory is principal German petrochem plant, main feed is natural gas, coke oven gas, and refinery gas, also benzene and pet fractions. Flow diagram showing products is given, also trade names of these. V. B.

213. Development of petrochemical industry in West Germany. W. A. Menne. *Erdöl u. Kohle*, 1953, **6**, 518–22.—Outline of position in the U.S.A. is given, also in the U.K., France, and Italy. At end of 1954 Western Germany will have 3·6 m tons/year cracking capacity (1·1 m thermal, 2·5 m cat). Possible yield of olefins up to C_4 will be 150,000 tons, with 25,000 tons saturateds from hydrogenation plants. All of this will not necessarily be available for chem purposes. Ethylene is mainstay of petrochem industry, and may, in Western Germany, in many cases replace acetylene. German petrochem industry should not aim at repeating, on a smaller scale, U.S.A. trends, but should develop in its own way; competition between the coal and pet industries could be wasteful, and co-operation and co-ordinated planning of the chemical sides of the two should be the aim. V. B.

214. Synthetic detergents from petroleum. P. W. Sherwood. *Erdöl u. Kohle*, 1953, **6**, 551–3.—Preferred detergents are alkylaryl sulphonates, alkylation fraction is mainly paraffinic kerosine cut, this is chlorinated (Cl uptake *ca* 21%) and condensed with C_6H_6 in presence of $AlCl_3$. Propylene tetramer can also be used for direct alkylation, with H_2SO_4 or HF as cat, latter is preferred in Germany. Sulphonation of the dodecyl-benzene is usually with oleum, followed by neutralization with NaOH, this leaves Na_2SO_4 in final product, which is normally an advantage. If low inorganic content is required sulphonation can be with liq SO_3. V. B.

215 Patents. U.S.P. 2,648,692 (18.5.51; 11.8.53). J. K. Mertzweiller, assr to Standard Oil Development Co. A process for the preparation of an unsaturated aliphatic etheral ester.

U.S.P. 2,648,693 (27.1.51; 11.8.53). L. Schmerling, assr to Universal Oil Products Co. A compound having the empirical structural formula:



wherein R, R_1, R_2, R_3, and R_4 are hydrogen or a long chain alkyl substituent containing from 4 to *ca* 15 carbon atoms per substituent or an alkyl radical containing from one to 3 carbon atoms per radical, one and only one of the alkyl radicals being a long chain alkyl substituent, n is equal to a whole number having a value of from 0 to 10, and Z is a polyoxyalkylene radical containing from 5 to *ca* 25 oxyalkylene units per radical, in which the alkylene group contains from 2 to 5 carbon atoms per alkylene group.

U.S.P. 2,648,694 (16.9.50; 11.8.53). R. B. Mason, assr to Standard Oil Development Co. A method for the preparation of higher mol. wt. aliphatic carboxylic acids.

U.S.P. 2,647,874 (G.B. 26.5.49; 4.8.53). E. Da Fano, assr to John B. Pierce Foundation, New York. A composition suitable for use as an automotive coolant, consisting essentially of a mixture of *iso*alkyl orthosilicates, mononuclear hydrocarbon aryl orthosilicates, and mixed mononuclear hydrocarbon aryl *iso*alkylorthosilicates in specified proportions.

U.S.P. 2,648,691 (23.8.51; 11.8.53). R. B. Thompson, assr to Universal Oil Products Co. A fatty material normally tending to become rancid and containing, as an inhibitor against development of rancidity, an organic sulphur compound.

U.S.P. 2,649,362 (28.2.50; 18.8.53). C. C. Fowler, assr to Marino Inc. A composition for improving the cutting efficiency of cutting implements. D. A. R.

MISCELLANEOUS PRODUCTS

216. Patents. U.S.P. 2,640,366 (10.5.50; 2.6.53). E. H. Knuth, assr to Diamond Alkali Co. Power transmitting belt of improved traction properties comprising a fibrous base impregnated with a lub oil and coated with a chlorinated paraffin wax of 35–75% chlorine content.

U.S.P. 2,640,763–7 (12.2.51; 2.6.53). J. A. Easley and H. E. Swayze, assrs to Dow Chemical Co. Etching bath comprising a mixture of: (*a*) aq HNO_3 and a C_{5-26} saturated aliphatic acid; (*b*) aq HNO_3 and an ester of a C_{12-18} aliphatic acid and a C_{2-6} polyhydric aliphatic alcohol; (*c*) aq HNO_3 and an ester of sulphosuccinic acid and a C_{4-12} aliphatic alcohol, and a water-immiscible org liq; (*d*) aq HNO_3 containing 3–50% HNO_3 and the ester of (*c*) in amount 0·0014–0·15 times the amount of HNO_3—for etching magnesium and magnesium alloys; (*e*) aq HNO_3 containing 3–25% HNO_3, a C_{12-30} pet sulphonate in amount 0·01–0·2 of amount of HNO_3, a liq pet fraction b.p. 90°–390° C in amount $\leqslant$1·3 times the wt of sulphonate but $\geqslant$0·15 of wt of HNO_3.

U.S.P. 2,640,782 (10.12.49; 2.6.53). H. S. Bloch and A. E. Hoffman, assrs to Universal Oil Products Co. Printing ink comprising a pigment and a mixture of a glyceride drying oil and a hydrocarbon drying oil formed by copolymerization at −80° to −20° C in presence of HF as cat of a mixture of 60–95 wt % of a $C_{>8}$ aliphatic conjugated diolefin and 40–5 wt % of a $C_{>8}$ aliphatic *iso*mono-olefin.

U.S.P. 2,640,820 (11.6.53; 2.6.53). A. S. Teot and G. C. Wiggins, assrs to Dow Chemical Co. Water-sol resin sulphonates are prepared by mixing 1 equiv wt of a benzene-sol polymer containing combined $\leqslant$50 wt % of $\leqslant$1 alkenyl aromatic compound of formula $ArCR{=}CH_2$, wherein Ar = monovalent aromatic radical, R = H,Me, with 0·8–3 mol equiv of SO_3 in a liq perchlorinated hydrocarbon at −20° to +45° C.

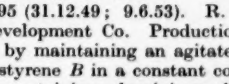
U.S.P. 2,640,858 (17.3.52; 2.6.53). W. H. Hohwieler, assr to U.S.A. (Secretary of the Army). Cold resistant cellular rubber product of a composition containing 55–58% of Pale Crepe; up to 0·2% of xylyl mercaptan + inert hydrocarbon; 1·2–1·3% S; 0·5–1·7% stearic acid; 1·7–2·8% ZnO; 0·5–1·1% salicylic acid + dispersant; 2·9–4·9% dinitrosopentamethylene tetramine + inert filler; up to 0·3% of 2:2-benzothiazyl disulphide; up to 0·1% tetramethyl thiuram disulphide; 11–12% TiO_2; 5–6% of a polymer of butenes as a heavy-bodied oil, and 16–18% of a high mol. wt. polyether of formula $(C_4H_9OC_2H_4OC_2H_4O)_2CH_2$.

U.S.P. 2,641,524 (13.7.49; 9.6.53). D. W. Chaney and H. G. Sommer, assrs to American Viscose Corpn. An interpolymer containing acrylonitrile and vinylamine in the mol. It may be produced by treating a shaped article of an acrylonitrile polymer containing CN and $CONH_2$ groups with aq NaOCl of 3–6% concn for 5 sec to 30 min at a temp inversely related to the time of 65°–35° C.

U.S.P. 2,641,595 (31.12.49; 9.6.53). R. F. Leary, assr to Standard Oil Development Co. Production of clear transparent polymers by maintaining an agitated mixture of *iso*butylene *A* and styrene *B* in a constant concn in 2–4 vol of methyl chloride containing aluminium chloride as cat at −80° to −100° C, and at a constant vol, maintaining a constant conversion of 40–80%, continuously adding a mixture of 38–32 wt % *A* and 62–68 wt % *B* in a fixed relative ratio, while continuously removing *A*, *B*, and a copolymer containing 58–62% combined *B* and having an intrinsic visc of 0·7–1·5 and a light transmission of $\leqslant$60% in a ½-inch moulded layer, the ratio of total amount of *A* and *B* added to mixture of *A*, *B* and product removed being adjusted so that the concn of *A*, *B*, and product in the polymerizing mixture is maintained constant.

U.S.P. 2,641,594 (16.5.51; 9.6.53). A. L. Barney, assr to E. I. du Pont de Nemours and Co. A vinylidene bis(hydrocarbon sulphone) in which the hydrocarbon radical is free from aliphatic unsaturation, and polymers thereof.

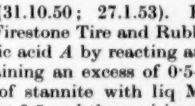
U.S.P. 2,624,755 (27.2.48; 6.1.53). E. W. Gluesenkamp, assr to Monsanto Chemical Co. A compound of the formula



wherein R is the α-ethyl-*n*-pentyl radical; useful as a plasticizer, especially for PVC.

U.S.P. 2,626,955 (31.10.50; 27.1.53). K. C. Eberly and C. E. Best, assrs to Firestone Tire and Rubber Co. Preparation of methyl stannic acid *A* by reacting an aq soln of alkali metal stannite containing an excess of 0·5–2·5 mol of alkali hydroxide per mol of stannite with liq MeCl at 0°–85° C, adjusting the pH to $>$3·5 and then raising the pH to 5·0–7·0 to ppt *A*. *A* readily condenses with itself and reacts with mercaptans to produce methyl tin mercaptides (useful as PVC stabilizers), etc.

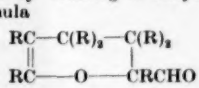
U.S.P. 2,626,953 (28.5.48; 27.1.53). G. P. Mack and E. Parker, assrs to Advance Solvents and Chemical Corpn. Polymeric organo-tin compounds of the formula



wherein R is the residue of an alcohol, R^1 and R^2 = alkyl or aryl, $n = >1$. The polymers are sol in many solvents, and are efficient stabilizers for halogen containing resins, *e.g.*, PVC, producing clear transparent products.

U.S.P. 2,626,954 (4.4.49; 27.1.53). H. E. Albert, assr to Firestone Tire and Rubber Co. A stannous complex produced by reacting a stannous salt of a strong acid with a mono- or poly-hydric phenol (except those containing *o*–OH groups) and alkali, the complex containing more tin than the normal phenolic tin salt and being light coloured. The complexes are useful as non-discolouring stabilizers for light coloured vulcanisates of synthetic rubbers, being superior to phenyl β-naphthylamine for this purpose.

U.S.P. 2,640,815 (11.9.48; 2.6.53). R. R. Whetstone and S. A. Ballard, assrs to Shell Development Co. A resinous product is obtained by reacting a dihydropyran carboxaldehyde of the formula



wherein R = H, halogen or C_{1-5} alkyl, with a polyhydroxy substituted aliphatic or aromatic hydrocarbon *A*, a hydrocarbon partial ether thereof *B*, or a hydrocarbon carboxylic acid partial ester of *A* or *B*, in an equiv ratio 1 : 5 to 5 : 1 in presence of an acid cat.

U.S.P. 2,640,822 (22.8.49; 2.6.53). D. Harman and H. J. Sommer, assrs to Shell Development Co. Novel N-acyl polyamines derived by condensing 1 mol of acrolein with 2–100 mol of ammonia or a primary amine and cat hydrogenating the product, the polyamines containing 2–20 wt % oxygen and having an equiv wt $\frac{1}{2}$–$\frac{1}{15}$ of mol. wt., are prepared by heating the polyamines at $>$200° C with a carboxylic acid of mol. wt. $>$140 while removing water produced in the reaction.

U.S.P. 2,640,848 (15.10.49; 2.6.47). D. Harman and De L. E. Winkler, assrs to Shell Development Co. Esters of sulphur-containing polycarboxylic acids, *e.g.*, di(2-ethylhexyl)-β : β′ sulphonyldibutyrate.

U.S.P. 2,640,855 (23.2.51; 2.6.53). J. B. Tindall, assr to Commercial Solvents Corpn. Production of N-methyl-1-*iso*butyl*iso*pentylamine by reacting at elevated temp/$>$1 atm in presence of an inert solvent and a copper chromite or a co-pptd copper oxide–calcium fluoride cat, a mixture of di-*iso*butylketone, methylamine, and hydrogen.

U.S.P. 2,640,857 (13.8.48; 2.6.53). J. L. van Winkle and R. C. Morris, assrs to Shell Development Co. A composition b.p. $>$100° C/10 mm Hg pressure is obtained by reacting chlorine with a mixture of low mol. wt., unsaturated, cyclic polymers in soln in an inert solvent at 0°–150° C until the product contains $\leqslant$10 wt % chlorine. The polymeric reactant is a fraction b.p. $>$380° C of a composition obtained by heating a dimethylsulpholene at 80°–200° C in presence of oxygen or a peroxide or by heating $\leqslant$1 methylpentadiene at 80°–200° C in presence of sulphur dioxide and oxygen or a peroxide.

U.S.P. 2,641,616 (G.B. 17.6.49; 9.6.53). L. P. Ellinger, assr to British Oxygen Co. In preparing ethers by vinylating C_{4-8} alcohols, the alcohol content of the reaction product is reduced by washing with an aq soln of alkali metal phenates, cresylates, or xylenates containing $\leqslant$20 wt % of the salt.

U.S.P. 2,641,579–80 (2.3.51; 9.6.53). (*a*) A. F. Benning, (*b*) H. Lewis, assrs to E. I. du Pont de Nemours and Co. A low-b.p. azeotropic refrigerant composition consisting of a mixture of: (*a*) $CHClF_2$ and C_2ClF_5 containing 63 mol % of $CHClF_2$; (*b*) C_2ClF_5 and CH_2CHF_2 containing 69 mol % of C_2ClF_5.

U.S.P. 2,641,600 (30.11.50; 9.6.53). A. A. Harban and C. A. Johnson, assrs to Standard Oil Co, Chicago. Production of alkenyl furans by reacting a furan having an unsubstituted α-hydrogen atom with a C_{4-12} conjugated diolefin at −30° to +60° C in presence of $\leqslant$0·02 mol of a non-olefinic hydrocarbon sulphonic acid, per mol of furan, in the form of an oxonium complex with a saturated ether.

U.S.P. 2,641,607 (15.6.50; 9.6.53). C. J. Albisetti and N. G. Fisher, assrs to E. I. du Pont de Nemours and Co. Preparation of unsaturated $C_{\leqslant 6}$ nitriles by heating at 215°–330° C/25–1020 atm a mixture of a neutral compound containing 1 or 2 ethylenically unsaturated non-conjugated double bonds, one of the carbon atoms of which is attached to a carbon atom carrying $\leqslant$1 hydrogen atom, and a 2-alkenenitrile of the formula RCH=CR′CN, wherein R and R′ = H or alkyl.

U.S.P. 2,624,766 (15.10.49; 6.1.53). J. M. Butler, assr to Monsanto Chemical Co. Tri-*iso*butenyl carbinol and sulphated and non-ionic detergents produced therefrom.

V. P. P.

U.S.P. 2,647,824 (20.1.49; 4.8.53). A. R. Jones and J. O. Smith, Jr., assrs to Standard Oil Development Co. A hydrocarbon composition normally characterized by oxidn instability containing small quantities of tetrahydro-quinoline tetrahydroquinaldine, decahydroquinoline, decahydroquinaldine, decahydroquinoline, decahydroquinaldine, and an oxidn inhibitor consisting of N-*n*-butyl paramino phenol, the composition containing a weight ratio of hydrogenated quinoline to inhibitor ranging from 0·1 to 10.

D. A. R.

CORROSION

217. Patents. U.S.P. 2,640,809 (19.12.50; 2.6.53). J. W. Nelson, assr to Sinclair Oil and Gas Co. In the production of oils from wells, corrosion is inhibited by adding to each 1000 brl of well fluid, 0·2–2 pints of a mixture of high mol. wt. acids produced by complete oxidn of microcryst wax, the acids having a sap No <200, being extremely water-insol and predominating in $C_{>18}$ monocarboxylic acids.

U.S.P. 2,641,559 (8.9.48; 9.6.53). M. H. Pakkala and F. J. Phillips, assrs to United States Steel Corpn. Oxide-coated ferrous articles are cleaned with a fused mixture, free from water and org matter, consisting of alkali metal nitrate 40–99·9 wt %, alkali metal nitrite 0–60 wt %, and alkali metal oxide (<2 O per mol) 0·1–5·0 wt %.

V. P. P.

ENGINES AND AUTOMOTIVE EQUIPMENT

218. Patents. U.S.P. 2,626,225 (18.8.47; 20.1.53). O. L. Brandes and C. B. Pattison, assrs to Gulf Research and Development Co. Gum, lacquer, and carbonaceous deposits are removed from an I.C. engine by operating for <90 min in absence of lub oil with the crankcase filled with a homogeneous mixture of 0·5–55 wt % water, 0·5–30 wt % of a water-sol detergent soap, and the remainder a mixture of a monohydric monocyclic phenol, a chlorinated hydrocarbon, and an alkyl or hydroxyalkyl ether of ethylene glycol or diethylene glycol, in ratio 7 : 3 : 8.

U.S.P. 2,625,010 (G.B. 2.4.47; 13.1.53). T. Clark, assr to Armstrong Siddeley Motors Ltd. Icing of I.C. turbine units is prevented by supplying throughout the intake end of the compressor *A*, combustion products from an independent auxiliary combustion chamber *B* alongside *A*, *A* supplying air to *B*.

SAFETY PRECAUTIONS

219. Minimizing the fire risk. Anon. *Elect. Times*, 1953, **124**, 766.—Synthetic substitute for transformer oil is blend 60% hexachlordiphenyl, 40% trichlorbenzene, + trace scavenger (tin tetra-phenyl) to absorb HCl which may be formed. Material ("Pyroclor," Monsanto) has S.G. 60° F 1·563, visc. (Saybolt) 54/100° F, dielectric strength (ASTM 877–49) 40 kV, dielectric const 4·3. It is non-flammable, and transformers filled therewith may be sealed; varnishes and synthetic rubbers are attacked, list of suitable insulating materials (including cotton and paper) is given. V. B.

MISCELLANEOUS

220. Communications and oil distribution. E. E. Fidler. *Petrol. Times*, 16.10.53, **57** (1466), 1035.—The advantages and uses of the teleprinter, recorders, and facsimile telegraphy in the oil industry are described. G. A. C.

221. Waste control at oil refineries. R. F. Weston. *Chem. Engng Progr.*, Sept. 1952, **48** (9), 459–67.—The efforts of the petroleum industry to control water pollution by refinery wastes since 1928 are summarized, and the origins of such wastes within the refinery are indicated. Methods of control from the standpoints of process design, recovery and utilization of waste products, local treatment, good housekeeping, and efficient treatment are considered in detail. J. G. H.

222. Production and utilization of raw materials in the British chemicals industry. Pt.2. Anon. *Petroleum, Lond.*, Aug. 1953, **16** (8), 224–6 (*cf.* Abstr. 125 of 1954).—Further abstracts of papers read at the symposium of the Society of Chemical Industry. Subjects include ethylene oxide production, petroleum-based additives, synthetic phenol manufacture, butane dehydrogenation, polythene, styrene, and polystyrene.

G. H. G.

223. The development of "probe and drogue" refuelling. P. S. MacGregor. *J. R. Aero. Soc.*, 1953, **57**, 510–19.—A review is given of flight-refuelling methods from 1923 to the present day. Topics covered in a discussion of recent developments include tanker, coupling, and receiver design, contacting, and flight trials. It is concluded that, in the future, large tanker aircraft may be capable of flight-refuelling a complete section of fighters in less than 2 minutes by means of a multi-point system. C. N. T.

224. Some aspects of fuel development in the U.S.A. W. I. Jones. *J. Inst. Fuel*, Sept. 1953, **26** (152), 127.—Some machinery used for the mechanization of American mines is discussed.

Principal aspects considered in this article are: coal preparation, carbonization, gasification, oil synthesis, hydrogenation of coal, synthesis, and domestic heating. Work is being carried out on a large scale on carbonization. There is much activity in the field of gasification, most processes use oxygen and aim at producing cheap synthesis gas and hydrogen from coal fines. Great interest is focused on the production of oil from coal or natural gas. Much progress is being made in the development of German improvements over the old Fischer–Tropsch process; in the main the application of fluidization. D. K.

225. Progress of Polish oil reviewed. M. Swiss. *Petrol. Times*, 16.10.53, **57** (1466), 1041; 30.10.53, **57** (1467), 1083.—This issue gives Pt I: The Three-Year Plan. The history of the industry since the end of the second world war is told. Some points include the adoption of the Soviet method of classifying crude oil by giving a few simple analytical data on its products; the considerable stress on economy and elimination of waste, and encouragement, by financial awards, of inventions. The "Foundation" plan was completed in 1949, including the drilling programme, and cracking was abandoned, but attention to pilot plant research was given.

The Six-Year Plan 1949–55 was published, and includes projects for 30% and 55% increases in production of crude oil and natural gas respectively.

Pt II deals with the Six-Year Plan to date, and includes a review of prospecting, drilling, and refining matters, together with administration machinery. Data show progress in drilling and production, and in refinery capacity and output.

G. A. C.

226. Science and technique in Soviet Union. Anon. *Nafta (Krakow)*, 1952, **8**, 334–6.—Includes a commemorative article on I. M. Gubkin, the organizer of Societ petroleum science and author of many books.

Soviet petroleum industry receives a spur from increased demands, since motor manufacture reaches now 150,000 tractors per year (120% of 1940) and 500,000 motor vehicles per year (140% of 1940 production). Great investments are made in Sakhalin and Turkestan.

Secondary production contributes to a large extent to overall figures; repressurizing with air gave 34% more oil, water under 11 atm pressure led to rise in production from 50 to 60% in one area to 250–300% in another. An idea to use water from overlying formation to obtain oil from the lower one is going to be tried out in Tuimaz.

Action of Ethomid-60 and Arquad-20 is very briefly described. M. S.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

227. Geophysics—its problems and trends. D. T. Germain-Jones. *J. Inst. Petrol.*, 1953, **39**, 335–45.—The present fields of development of geophysics are discussed broadly. The problems associated with the obtaining and interpretation of seismic records are reviewed. A. R. W. B.

228. Patents. U.S.P. 2,649,579 (1.2.50; 18.8.53). W. A. Alexander, assr to Standard Oil Development Co. Improved portable seismometer of the capacitor type.

U.S.P. 2,650,069 (23.9.49; 25.8.53.) W. W. Rand, assr to Union Oil Co of California. An apparatus for core sampling geologic strata submerged beneath a body of water.

D. A. R.

DRILLING

229. Patents. U.S.P. 2,625,445 (23.9.49; 13.1.53). R. Ring, assr to Sperry-Sun Well Surveying Co. A guide for centring borehole tools *B* in a conduit *C* comprises a retainer *R* of less dia than *C* adapted to be joined to *B*, and flexible guide rings of greater dia than *C* passing transversely through *R*. Parts of the rings engage the wall *C* and are thereby deformed. The rings centre *R* in *C* and provide passages for fluid between *R* and *C*.

U.S.P. 2,624,413 (28.6.46; 6.1.53). R. A. Mueller and R. L. Crain, assrs to Gray Tool Co. Oilwell hanger capable of providing complete mechanical control during the landing of an oilwell pipe such as the casing, by automatically providing simultaneous seals both within and around the hanger when the hanger is landed.

U.S.P. 2,624,409 (26.10.46; 6.1.53). F. E. O'Neill. Casing cutter apparatus of the hydraulic jet type which can be lowered in a well conduit on a flexible line, in which the apparatus receives cutting fluid under pressure directly through the conduit and impinges it directly against the conduit.

U.S.P. 2,626,777 (17.4.50; 27.1.53). M. E. True, assr to Standard Oil Development Co. Device which may be operated through a conventional core bit to take a side wall core and a fluid sample and which may be retrieved by a wire line without withdrawing the core bit from the borehole.

U.S.P. 2,625,226 (12.12.47; 13.1.53). C. A. Wofford, assr to Engineering Laboratories Inc. Device for obtaining fluid samples from well bores, designed to prevent the escape

of gas or liq therein, in which a tubular designed clock actuates a lever releasing the valves, thereby allowing fluid to pass into and through the sampler, and then allows them to close at a predetermined time.

U.S.P. 2,626,979 (7.4.48; 27.1.53). J. P. Woods, assr to Atlantic Refining Co. Apparatus for electrically logging boreholes.

U.S.P. 2,626,788 (28.1.49; 27.1.53). D. Ragland, assr to Standard Oil Development Co. Mud mixer and agitator having low power requirements and whose parts are not subjected to excessive wear by the mud. V. P. P.

U.S.P. 2,633,331 (7.9.48; 31.3.53). H. Hampton. Apparatus for preparing a well casing for sidetrack drilling.

U.S.P. 2,633,333 (17.5.48; 31.3.53). L. W. Storm. Pipe spinner for well drilling rig.

U.S.P. 2,633,334 (14.11.49; 31.3.53). W. H. Lavender. Rotary drilling apparatus.

U.S.P. 2,633,335 (20.2.47; 31.3.53). D. W. Hart, assr to Ingersoll–Rand Co. Rock drill bit of the impact type.

U.S.P. 2,633,336 (13.12.48; 31.3.53). J. C. Stokes, assr to Reed Roller Bit Co. Core drilling apparatus.

U.S.P. 2,633,374 (1.10.48; 31.3.53). E. G. Boice, assr to Reed Roller Bit Co. Coupling member for drill pipes.

U.S.P. 2,633,484 (30.7.51; 31.3.53). C. W. Zimmerman, assr to Socony-Vacuum Oil Co. Calibration of logging systems.

U.S.P. 2,633,485 (20.3.52; 31.3.53). H. W. Patnode, assr to Gulf Research and Development Co. Electrical dip meter for logging boreholes. J. M. S.

U.S.P. 2,647,582 (9.2.44; 4.8.53). C. C. Brown and E. L. Potts, Potts assr to Brown. An apparatus for inserting a separation plug behind cement in a well pipe and in advance of a following pressure fluid without halting the pumping operation.

U.S.P. 2,647,583 (7.7.47; 4.8.53). B. Kriegel, assr to Baker Oil Tools Inc. Pressure compensated valve device for well tools.

U.S.P. 2,647,584 (11.3.49; 4.8.53). J. R. Baker and M. B. Conrad, assrs to Baker Oil Tools Inc. A well packer and bridge plug having a body; an expander on the body; and a circumferentially continuous frangible slip member engageable with the expander, the expander being movable longitudinally with respect to the slip member to exert a lateral force on the slip member to break the slip member into segments.

U.S.P. 2,647,585 (2.2.49; 4.8.53). G. H. Roberts. Heater for oil and other wells.

U.S.P. 2,647,728 (3.7.47; 4.8.53). A. L. Smith. An inside drill pipe automatic blowout preventer for insertion in the drill pipe employed in the rotary method of well drilling.

U.S.P. 2,647,729 (22.9.49; 4.8.53). D. L. Del'Homme, assr to Reed Roller Bit Co. Wear indicating device for drill bits.

U.S.P. 2,647,804 (23.5.51; 4.8.53). W. B. Noble, assr to Roller Bit Co. A bit having a shaft and roller cutters rotatable on the shaft, and means for adjusting according to wear the bearings for the roller cutters.

U.S.P. 2,648,522 (24.4.51; 11.8.53). A. L. Armentrout. Method of recovering circulation which has been lost in the course of drilling a well.

U.S.P. 2,648,526 (G.B. 9.4.46; 11.8.53). H. G. Lanchester, assr to Clyde Drilling and Prospecting Equipment Co. Rotary earth-boring bit.

U.S.P. 2,648,780 (15.5.50; 11.8.53). G. Herzog, assr to Texas Co. Combination induced and scattered gamma-ray borehole logging.

U.S.P. 2,650,072 (18.8.50; 25.8.53). A. W. Kammerer. Multiple expansion rotary drill bit.

U.S.P. 2,650,129 (31.3.51; 25.8.54). E. F. Axelsen. Cable retrieving apparatus for use in well casings.

U.S.P. 2,650,196 (21.4.53; 25.8.53). H. W. Rahn. A method of preparing a well drilling composition which comprises forming an aq dispersion of a tannin containing bark and sodium hydroxide in an amount in excess of that which will react with the bark components, and heating the mixture at a temp above 100° C, but below a temp at which substantial pyrolysis of the bark components occurs, until a dry product is obtained.

U.S.P. 2,650,197 (21.4.53; 25.8.53). H. W. Rahn. A solid, granular well treating composition.

U.S.P. 2,650,314 (12.2.52; 25.8.53). G. W. Hennigh and H. D. Ridge. Apparatus for pulling a tool into a well bore comprising a submerged electric motor. D. A. R.

PRODUCTION

230. Neutral black emulsifier ("Kontakt"). S. Rachfal. *Nafta (Krakow)*, 1953, **9**, 97–9.—To break up emulsions formed in production of ever increasing quantities of crude larger volumes of demulsifiers are required daily. Naphthenic acids so far used are short, and the alternative is N.Cz.K. (Neutral Black "Kontakt") as used in U.S.S.R. It is obtained by neutralizing the sludge from SO_3 treatment of gas oils and kerosines. Sludge is a mixture of hydrocarbons, sulphonic acids, H_2SO_4, and water. Sulphonic acids reach up to 75%. Commercial "Kontakt" of 50% sulphonic acid content was well known, but it contained only the original oil phase soluble sulphonates. Sludge was first utilized in 1930. 1% of sludge cleared emulsion of 36% water down to 1·2% H_2O on 1 hr at 50° C (Szneider and Buch) neutralized sludge is even more efficient (Denemark). Oils treated with conc or fuming H_2SO_4 give sludge of high H_2SO_4 content, so water washing gives economy in alkali—usually milk of lime 10°–12° Be. N.Cz.K. has according to specifications minimum contents of 15% of sulphonic acid salts. The active parts are derived from sulphonation of unsaturated naphthenes. Those obtained from vaseline oils have average mol. wt. 350 and are saturated. A fraction soluble in ether has a formula $C_{16}H_{31}SO_3H$. Anhydrous acids are transparent amorphous solids not hydrolyzed by hot water or alkali. Alkali metals, heavy metals, and Al give insoluble salts. Acids and soluble salts homogenize a 80%–20% to 90%–10% oil–water mixture. In practice, thoroughness of mixing, temp (40°–55° C), and duration of warming play important parts. Low water content of emulsion makes its removal more expensive in "Kontakt." 0·7–1·0% of "Kontakt" are required, and it reduces water to 0·5–1·5%. In case of high salinity a water wash may be required before application of "Kontakt." A flow diagram is enclosed. M. S.

231. Patents. U.S.P. 2,625,039 (30.9.48; 13.1.53). H. J. Wagner. Apparatus for detecting seepage of water into wells comprising means entering a well for isolating any position thereof, a receptacle *B* communicating with the isolated portion *A* for receiving water seeping into *A*, a vertically disposed electrical resistance unit *C* in, but electrically isolated from, *B*, an electrical circuit including *B* and *C*, including means for registering the decrease of resistance in the circuit as water rises in *B*.

U.S.P. 2,624,414 (13.3.48; 6.1.53). W. B. Harrell and A. H. Trester, assrs to Harrell Sales Co. Oil well bailer of the type by which sand is displaced into the barrel of the bailer by a vertically reciprocating plunger in the barrel, sand binding of the plunger being prevented by providing one or more fluid escape openings communicating directly with the inter barrel-plunger space through the barrel instead of through the plunger.

U.S.P. 2,624,411 (7.8.50; 6.1.53). W. H. Ellis. A strainer for use in the bottom of a well to prevent entrance of dirt, etc., into a well pipe without impairing the free flow of the fluid in the well, comprises a nipple adapted to be attached to the lower end of a well pipe from which is suspended a stack of spaced filter plates *A* having passages therein which communicate with the passage through the nipple and a conical pilot suspended from the nipple and forming a stop against which the lower end of *A* engages.

U.S.P. 2,624,410 (25.7.47; 6.1.53). J. D. Dixon. System for secondary recovery in oil wells wherein a vacuum is created and maintained in the well by circulating a liq stream, preferably water, under a relatively high velocity through means for setting up a suction at a point in the stream and utilizing the suction to pull the vacuum in the well, whereby gas or air in the well is sucked into the stream, and then reducing the velocity and separating the gas or air therefrom. The liq stream is preferably recirculated.

U.S.P. 2,626,779 (16.12.49; 27.1.53). A. L. Armentrout. Lost circulation occurring in productive strata *A* in oil wells is recovered by introducing into the circulation fluid *B*, screened sand and gravel, which is carried thereby to the interstices or fractures in *A*, and immediately thereafter introducing into *B* diatomaceous earth so as to form a filter cake on the sand and gravel for the deposit thereon of the mud sheath produced by *B*.

U.S.P. 2,626,778 (15.5.48; 27.1.53). J. R. Lockett. Well casing is replaced by a liner and packer assembly to seal the well against water penetration.

U.S.P. 2,640,810 (14.9.50; 2.6.53). P. H. Cardwell and C. L. Lunsford, assrs to Dow Chemical Co. In acidizing with aq HCl a calcareous formation containing a silicate capable of swelling as the acid becomes spent, formic acid or a formate is added to the acid as a buffer.

U.S.P. 2,624,412 (25.2.49; 6.1.53). T. M. Ragan, assr to Baker Oil Tools Inc. Hydraulic fluid pressure booster for setting a well packer in a casing or bore.

U.S.P. 2,624,603 (13.9.49; 6.1.53). C. H. Sweet, assr to Sweet Oil Well Equipment Co. Well packer comprising a cylindrical member of resilient material having a major bore section therethrough, and a relatively shorter internally restricted section forming a minor bore therein, the restricted section graduating from the major dia and back again thereto, and being located nearer one end of the packer than the other end. V. P. P.

U.S.P. 2,648,012 (5.10.49; 4.8.53). S. A. Scherbatskoy, assr to Perforating Guns Atlas Corpn. Nuclear well logging.

U.S.P. 2,648,014 (17.2.50; 4.8.53). M. G. Arthur, assr to Union Oil Co of California. A method for determining the injection profile of an injection zone of a well.

U.S.P. 2,648,056 (1.11.48; 4.8.53). J. J. Jakosky, assr to Union Oil Co of California. A method for measuring subsurface openings containing fluids of variable sonic velocities.

U.S.P. 2,649,158 (19.2.49; 18.8.53). F. A. Reed. An inverted well packer.

U.S.P. 2,649,159 (24.2.51; 18.8.53). J. S. Boyer, assr to Sun Oil Co. The method of sealing a porous formation traversed by a well borehole, which comprises: introducing into the borehole a fluid sealing agent comprising a gross suspension of particles of solid material in liq material, the solid material being melamine, urea, thiourea, resorcinol, pyrogallol, or catechol, and the liq material comprising an aldehyde condensable with the solid material to form a thermosetting resin.

U.S.P. 2,649,163 (23.6.49; 18.8.53). R. Atkins, assr to Union Oil Co. A method for determining the cross-sectional dimensions of an elongated borehole containing a borehole liq.

U.S.P. 2,649,710 (13.12.48; 25.8.53). C. R. Dale. Oil well flowmeter.

U.S.P. 2,649,711 (13.12.48; 25.8.53). C. R. Dale. A well flow meter comprising a housing adapted to be lowered in the well liq, a rotor in the housing and exposed to the liq for rotation by and in accordance with the liq flow through a passage in the housing, indicating means energized in accordance with rotations of the rotor, and a radially deflectable flow trap carried by and of larger dia than the housing and operating to divert vertically flowing well liq into the housing passage and against the rotor, the trap comprising a radially contractable assembly of circularly arranged vanes in circularly overlapping arrangement, the vanes being separately formed and being relatively bodily movable into increased overlapping relation upon radial contraction of the trap.

U.S.P. 2,649,715 (8.5.47; 25.8.53). R. W. Goble, assr to Eastman Oil Well Survey Co. A temp measuring and recording apparatus including an electrical temp measuring circuit comprising a Wheatstone bridge, a fixed resistance in each of two legs of the bridge, a temp responsive element adapted to be lowered within a well bore and electrically connected in third leg of the bridge circuit, whereby the temp changes affecting the temp responsive element produce variations in the bridge circuit.

U.S.P. 2,649,786 (1.4.48; 25.8.53). R. W. Goble, assr to Eastman Oil Well Survey Co. A well caliper apparatus for measuring the cross-sectional area of a well bore, including a measuring instrument having linear electrical response.

U.S.P. 2,649,914 (6.3.48; 25.8.53). H. C. Otis. A flow guiding device adapted to be positioned in a well flow conductor for reducing turbulence of fluids flowing from a subsurface well flow control device mounted in the conductor.

U.S.P. 2,649,915 (3.12.46; 25.8.53). I. A. Miller, assr to Otis Engineering Corpn. A circulating device for use in a well, including a tubular housing having a lateral circulation port formed therein and an internal stop shoulder below the port, a plug fitting the port initially closing the same and having a shear tip on its inner end, and a reinforcing sleeve slidable in the bore of the housing and limited against downward movement by the stop shoulder in the housing, the reinforcing sleeve having a recess in its exterior surface receiving the shear tip of the plug and initially supporting the plug against displacement inwardly of the port, the shear tip being shearable upon movement of the sleeve upwardly above the port to permit the plug to be displaced inwardly of the circulation port.

U.S.P. 2,649,916 (24.9.51; 25.8.53). C. C. Brown. A well packer.

U.S.P. 2,649,917 (3.5.49; 25.8.53). A. L. Simmons, assr to Sells–Simmons Hydrostatic Bailer Corpn. Combination oil well hydrostatic cleanout bailer.

U.S.P. 2,650,194 (7.9.49; 25.8.53). H. W. Rahn, assr to Columbia–Southern Chemical Corpn. A solid granular well-treating composition produced by heating an aq liq mixture of an alkali metal hydroxide and a tannin at a temp of 250°–650° F, until a solid reaction product has been obtained, amount of alkali metal hydroxide in the composition being substantially in excess of that required to react with the tannin to produce a neutral product.

U.S.P. 2,650,195 (26.5.52; 25.8.53). P. H. Cardwell and F. H. Braunlich, assrs to Dow Chemical Co. The method of controlling loss of circulation fluid from a well hole into a thief zone which comprises introducing into the circulation fluid particulated solids having a coating thereon of a resinous liq of a partially condensed mixture of a phenol and an aldehyde, and containing an alkali cat capable of promoting further condensation of the resinous liq into a hard resin, the coating containing in its surface a condensation promoting agent which is phenylethanolamine, di-2-ethylhexylamine, octylamine, hexylamine, heptylamine, or di-*iso*amylamine. D. A. R.

TRANSPORT AND STORAGE

232. Old quarries for oil storage. V. B. Guthrie. *Petrol. Process.*, 1953, **8** (8), 1168–9.—Esso Standard Oil Co in the U.S. intend to make a reservoir for heating oils out of an old slate quarry which is situated about 60 miles from its New Jersey refinery.

Some of the pits available for oil storage have a capacity of up to 10 million brl. The necessity to protect the oil from direct sunlight, dust, and animal life in the quarries has become apparent, and 2 types of roof for the pits are being studied: either a pontoon roof, made up from sections, or a suspension roof hung on a network of cables spanning the quarry. J. W. H.

233. Patents. U.S.P. 2,624,490 (18.3.50; 6.1.53). A. F. Fino and F. L. Plummer, assrs to Hammond Iron Works. Converting existing closed liq-storage metallic tanks for volatile liq, such as gasoline, into diaphragm type tanks.

U.S.P. 2,624,553 (21.1.48; 6.1.53). R. W. Thompson and A. H. Graham, assrs to General American Transportation Corpn. Heating system for tanks, including a hot plate disposed in juxtaposition to the bottom of the tank, and completely underlying the lading, and providing the proper sloping surfaces for complete drainage of the lading from the tank.

U.S.P. 2,625,042 (7.1.48; 13.1.53). B. L. Binford, assr to Magnetrol Inc. Mechanism for sensing changes in the level of a liq in a tank in which the changes produce a multiplied movement in a manometer type device which is free of mechanical friction.

U.S.P. 2,625,043 (4.4.52; 13.1.53). H. F. Tapp and G. D. Robinson. Electrical apparatus for measuring the temp of the liq in a tank at various levels wherein the proper resistor of any given depth of liq in the tank is automatically connected into the circuit of the measuring instrument.

U.S.P. 2,625,298 (15.4.49; 13.1.53). F. L. Healy and J. J. Connors, assrs to Todd Shipyards Corpn. Combustion products, such as flue gases from a boiler or oil burner or exhaust gases from an I.C. engine, are introduced into storage tanks containing inflammable or explosive vapours to render them inert.

U.S.P. 2,625,314 (3.4.48; 13.1.53). F. D. Moyer, assr to Chicago Bridge and Iron Co. In a liq storage tank with a floating roof, means of descent from the side wall of the tank to the roof comprise a platform adjacent the upper portion of the side wall, a spiral ladder extending downwards from the platform through the roof, and means operatively connected with the ladder and roof to cause relative rotation there between during vertical movement of the roof.

U.S.P. 2,625,272 (25.8.50; 13.1.53). A. A. Arvintz, N. R. Arvins, and R. A. Arvintz, assrs to Sanicom Co. Filling caps countersunk into a pavement of a filling station, etc., for use in transferring fuel from a supply vehicle to tanks under the pavement, having means for quickly removing the cover plate on which is incorporated a seal valve member to provide a dual seal or closure, eliminating entrance of water into the filter chamber of the device. V. P. P.

U.S.P. 2,637,111 (27.3.47; 5.5.53). P. McDuff. Gauging device for oil tanks.

U.S.P. 2,637,768 (30.8.49; 5.5.53). C. E. Bragg, assr to Standard Oil Co. Indicator for measuring interface between 2 liq phases.

U.S.P. 2,638,138 (7.1.49; 12.5.53). L. J. Proebstle, assr to Goodyear Aircraft Corpn. Supporting enclosure for flexible, large capacity aircraft fuel cells.

U.S.P. 2,638,247 (20.7.50; 12.5.53). N. D. Taylor, assr to Hancock Oil Co of California. Liq fuel dispensing unit fitted with means for dispersing measured quantities of additives.

U.S.P. 2,638,924 (28.11.49; 19.5.53). T. A. St. Clair, assr to Phillips Petroleum Co. Automatic quick-closing tank valve.

U.S.P. 2,639,671 (11.10.49; 26.5.53). B. Wagner, assr to Gulf Oil Corpn. Self-priming centrifugal pump unit for liq dispensing apparatus.

U.S.P. 2,639,944 (7.8.47; 26.5.53). E. S. Higginbotham, assr to Tokheim Oil Tank and Pump Co. Liq fuel dispensing pump. J. M. S.

U.S.P. 2,648,058 (17.5.51; 4.8.53). H. B. Breedlove, assr to Standard Oil Development Co. Apparatus for detecting variation of level of liq in a container vessel.

U.S.P. 2,648,133 (25.4.52; 11.8.53). J. Kosmoski and G. A. Meyer. An instrument for measuring the diameter of a storage tank and simultaneously measuring the depth of liq in the tank and thus ascertaining the amount of liq contained in the tank.

U.S.P. 2,648,201 (2.9.51; 11.8.53). F. G. Marancik and J. A. Laudenberger, assrs to Standard Oil Development Co. Apparatus for the offshore loading and unloading of a high pressure fluid product comprising a liq leg and a vapour leg both formed by swivel-connected sections of pipe extending between the ship's tank and the termination of a fixed submarine line.

U.S.P. 2,648,457 (30.9.49; 11.8.53). F. D. Moyer, assr to Chicago Bridge and Iron Co. A circular floating roof having a trusswork inter-connecting the inner posts and a truss system connecting radially aligned posts with the rim and being connected together at the centre of the roof above the deck. D. A. R.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

234. Major refining area takes shape. F. Breese. *Petrol. Process.*, 1953, **8** (9), 1313–15.—3 new refineries with a total charge of 96,000 b.d. are either under construction or in the planning stage in the Pacific North West area of America. 2 expansion units are also under way which will boost present capacity by 17,500 b.d.

The 3 new refineries and the 2 expansion projects represent 113,500 b.d. of new capacity. Existing capacity totals 44,550 b.d. That makes a total of over 158,000 b.d. of crude charging capacity which should be operating by 1955.

The 718-mile long pipeline from Edmonton in Canada to Vancouver will be finished shortly, and it is expected that this 24-inch crude oil pipeline will carry 150,000 b.d. by next year. Ultimately the capacity will be raised to 300,000 b.d. by the addition of more pumping stations. J. W. H.

235. Build a flare for under 5000 dollars. M. R. Beychok. *Petrol. Process.*, 1953, **8** (8), 1162–3.—A new horizontal type flare burner has recently been installed at a California refinery with a cost less than $5000 and a design capacity of 2 million cu. ft/day.

The waste gases are burnt behind a large cement wall by 3 banks of burners. The gases arrive at the burners via a vertical liq trap, where the liq carry-overs are caught and drained off. The burners are lighted by constantly burning pilot flames. The cement wall is steel reinforced and is enclosed by an earthen retainer; the whole being approx 4 ft high. J. W. H.

236. How a small plant makes octanes. D. P. Thornton. *Petrol. Process.*, 1953, **8** (8), 1159–61.—Small refiners are facing an octane problem to-day. They find difficulty in keeping abreast of competition with larger refineries, who are always raising the O.N. of their gasoline.

The article is concerned with the case of a small refinery in Texas, with a 2000-b.d. capacity. By the installation of a 750-b.d. Atlantic cat reforming unit in this refinery it was possible to up-grade the straight-run naphtha to give a high-octane product in the highest possible yield.

The economic aspects of the problem are analysed, and net revenue figures quoted for topping alone and topping with reforming. J. W. H.

237. Electrical distribution systems. W. A. Sibson, H. G. Buch, and J. F. Eisenhardt. *Petrol. Process.*, 1953, **8** (9), 1342–4.—5 of the major factors in the design of electric distribution systems are presented. These include the heat balance, the analysis of the electrical load, estimates for the new process unit, and the 2 voltage system. Each of the 5 factors are carefully analysed and the relative importance of each is stressed.

The actual conditions existing in the refinery, and its location will affect the type of distribution system used. The cost of the electrical power is also of major importance. J. W. H.

238. Tips on sealing light hydrocarbons. R. E. Morgan. *Petrol. Process.*, 1953, **8** (9), 1340–1.—In the sealing of pumps handling light liq, with high vapour pressures, such as those obtained when petroleum gases are liquefied, some applications present a great deal of trouble. These difficulties are discussed, and some of the remedies proposed.

A chart of temp vs v.p. for some light hydrocarbons is also given, and the effects of temp and v.p. on a mechanical seal handling liq propane is given in tabular form. J. W. H.

239. What type blowers do you need? H. W. Woodhouse. *Petrol. Process.*, 1953, **8** (9), 1325–7.—Arguments for selection of either a positive displacement or a centrifugal blower are discussed, and their respective characteristic performance curves are presented showing adiabatic efficiency, capacity, and h.p. input.

It is stated that the final analysis selection of a blower should be determined by specific needs of operation. J. W. H.

240. Troubles and trends in the use of mechanical shaft seals. J. G. Walmsley and H. A. Ward. *Petrol. Refin.*, 1953, **32** (9), 203–6.—An account of the design, operation, maintenance, and cost of both balanced and unbalanced mechanical seals. R. D. S.

241. Why not use draft tubes? A. P. Weber. *Chem. Engng*, 1953, **60** (10), 183–7.—These are flow directing devices used with liq mixers to develop a desired flow pattern. The major applications of draft tubes are listed and diagrammatically illustrated. D. M.

242. Entrainment separation. C. F. Montross. *Chem. Engng* 1953, **60** (10), 213–36.—A comprehensive treatise on the theory and practice of entrainment separation. Initially dealing with the applications, the ideal characteristics of separators, and general factors in design and selection. A list of tables follows, giving details of available equipment plus figures of cut-away diagrams showing methods of operation. Finally, a section is devoted to the derivation of design equations, introducing gravity, centrifugal, diffusional, coalescence, impingement, electrostatic, and sonic effects. 57 refs. D. M.

243. Chemical engineering unit processes. *Industr. Engng Chem. (Industr.)*, **45**, 1899–2064.—Reviews on alkylation, amination by reduction, ammonolysis, combustion, esterification, fermentation, halogenation, hydrogenation and hydrogenolysis, nitration, oxidn, polymerization, pyrolysis of coal and shale, pyrolytic and cat decomposition of hydrocarbons, sulphonation, and sulphation. E. J. C.

244. Role of super-refractories in the chemical and hydrocarbon industries. A. A. Turner, H. M. Killman, and R. W. Brown. *Chem. Engng Progr.*, June 1953, **48** (6), 281–7.—Super-refractories, as used in the construction of chemical plant, are defined and classified, and their special fields of application in oil-gas equipment, regenerative and continuous reforming apparatus, synthesis gas reactors, fusion apparatus, coking ovens, and pebble heaters are described, together with special applications in abrasion-resisting equipment. J. G. H.

245. Vaporization rates and heat-transfer coefficients for pure liquid drops. R. D. Ingebo. *Chem. Engng Progr.*, Aug. 1952, **48** (8), 403–8.—The importance of accurate knowledge of liq vaporization rates in the design of such equipment as jet-propelled aircraft, spray dryers, and cooling towers is noted, and the results are reported of a study of droplets under conditions similar to those encountered in aircraft combustion systems. Vaporization rate data and surface temp data were outlined for 9 pure liq, nitrobenzene, *n*-octane, benzene, methanol, acetone, water, ethanol, butanol, and carbon tetrachloride, evaporating from the surface of a porous sphere. Experimentally evaluated heat-transfer coeff were found to correlate a semi-empirical equation expressing the Nusselt No. for heat transfer as a function of a new dimensionless No. and the thermal conductivity ratio.

Surface temp determined for the 9 pure liq were found to be approx equal to the wet-bulb temp. A new method of predicting wet-bulb temp from boiling point data and wet-bulb data for water was also developed. J. G. H.

246. Flash vaporization: analysis of fluid, mechanical, and mass-transfer problems. R. R. Hughes, H. D. Evans, and C. V. Sternling. *Chem. Engng Progr.*, Feb. 1953, **49** (2), 78–87.—The general concepts of fluid atomization, drop separation, and flashing efficiency are discussed, together with their relation to the design of the vaporizer, transfer lines, and separator. The concepts are developed semi-quantitatively as a guide to further development and design work on these flashing processes. J. G. H.

247. Relation of space velocity and space–time yield. S. Kodama, K. Fukui, and A. Mazume. *Industr. Engng Chem. (Industr.)*, 1953, **45**, 1644–8.—Discusses theoretical aspects of fixed-bed cat reactor design. E. J. C.

248. Contamination of surface waters by waste oils. D. E. Bloodgood. *Lubric. Engng*, Apr. 1953, **9** (2), 81–4, 99.—The effect of oil waste on surface water is briefly described, and objections to its dispersal in this manner are enumerated. Methods for oil waste handling and treatment are surveyed as evolved by the oil companies, and the essential fundamentals of oil waste treatment are set out. J. G. H.

249. Pipeline design for non-Newtonian solutions and suspensions. G. E. Alves, D. F. Boucher, and R. L. Pigford. *Chem. Engng Progr.*, Aug. 1952, **48** (8), 385–93.—The design of pipelines for the transport of non-Newtonian soln and suspensions calls for methods of evaluating visc and computing pressure drop which differ from those used for simple Newtonian fluids. Data are presented on the classification of non-Newtonian fluids and methods of obtaining shear diagrams by the use of rotational or pipeline-type viscometers, together with the application of such diagrams to the design of plant-scale pipelines. Confirmatory experimental data are presented for 4 representative materials, and a design procedure is set out for sizing a pipeline or computing pressure drop. J. G. H.

250. Hydrocarbons from pipeline gas. N. L. Foskett and R. C. Foster. *Petrol. Refin.*, 1953, **32** (9), 116–19.—A discussion of the design considerations in extracting hydrocarbon feed stock from pipeline gas, illustrated by reference to the plant at Gabe, Kentucky. R. D. S.

251. Shortcut to heat exchanger design—IV. C. H. Gilmour. *Chem. Engng*, 1953, **60** (10), 203–7.—The vertical vapour-in-tube type of heat exchanger is considered to be the best type of unit to use where sub-cooling of the condensate is involved. The advantages of this system are listed against the chief disadvantages of other types of condensers and subcoolers. Alignment charts are included, and an example illustrates the short-cut method. D. M.

252. Costs for special exchanger designs. F. L. Rubin. *Chem. Engng*, 1953, **60** (10), 196–202.—The last of 4 articles on heat exchanger costs. Here details of costs for spiral plate or tube, plate coil, cascade coolers made of various materials, and self-cleaning tubular exchangers are quoted in graphical form. Other types mentioned are bayonet tube, air-cooled, cubic heat, and tantalum exchangers. These are all shown in cut-away diagrams. D. M.

253. Patent. U.S.P. 2,647,758 (8.12.50; 4.8.53). R. P. Trainer, assr to Shell Development Co. Apparatus for heating powdered solids by direct contact with hot combustion gases. D. A. R.

DISTILLATION

254. Effect of column holdup and reflux ratio in binary batch distillation. A. Rose, R. C. Johnson, and T. J. Williams. *Chem. Engng Progr.*, Nov. 1952, **48** (11), 549–56.—Details are presented of the results of a series of actual batch dist in a 5-plate column with variations in reflux ratio, charge composition, and charge size, these being varied over and beyond the entire range of practical interest. Results are summarized on a single graph, indicating the favourable and unfavourable effects for all the combinations of the variables for dist with a particular column and mixture. Theoretical calculations made for similar circumstances show substantial agreement with experimental results obtained. It is considered unwise to expect dist in many plate columns to show more than agreement in the trends of the results with 5-plate columns. Computational procedures have been reviewed elsewhere. J. G. H.

255. Multicomponent distillation. 3. Equations in product form and simplified application. P. G. Murdock and C. D. Holland. *Chem. Engng Progr.*, May 1952, **48** (5), 254–60.—Previous papers (see Abs. **486, 1491**, of 1950) have developed algebraic equations applying to theoretical plate multicomponent dist in which the volatility ratios and the molal vapour and liq flow within each section of the column are constant. Present paper presents a simplified equation for use with constant volatility ratios, and indicates results obtained being of adequate accuracy and resulting in a marked economy of time. J. G. H.

256. Multicomponent distillation. 4. Determination of minimum reflux. P. G. Murdoch and C. D. Holland. *Chem. Engng Progr.*, June 1952, **48** (6), 287–92.—2 alternate equations for minimum reflux ratio are presented, both assuming constant molal reflux and being exact when volatility ratios are constant throughout the column. First is designated as overall balance equation, the second as pinch balance equation, and the conditions under which each may be used are indicated. J. G. H.

257. Stedman packing design data. L. B. Bragg. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1666–7.—Correlation of data on above type packing presented in form of graph relating theoretical plates/ft to reflux rate in g.p.h. E. J. C.

258. Performance of perforated-plate distillation columns. D. S. Arnold, C. A. Plank, and E. M. Schoenborn. *Chem. Engng Progr.*, Dec. 1952, **48** (12), 633–42.—Perforated-plate behaviour studies were carried out using air and water in a 15-inch dia glass-walled column containing 3 plates spaced 18 inches apart. Perforated dia varied from 0·059–0·373 inches, free-space ratios from 3·9–11·4% with downflow weir heights of ¼, 1, 2, and 4 inches providing corresponding liq seals. Pressure drop data were obtained for water-mass velocities ranging from 0–2700 and from 70–900 lb/(hr) (sq. ft. of column cross-section) respectively.

Over range of variables studied pressure drop due to the dry plate was proportional to the 1·8 power of the gas velocity, and was correlated by a modification of the orifice equation. With liq flowing across the plate limiting air velocities were established above which no leakage through the holes occurred. Below these velocities operation is unstable.

In the region of stable operation methods are given for prediction of total measured pressure drop, and application of the data obtained to design is discussed. J. G. H.

259. Continuous extraction in a multistage mixer column. J. Y. Oldshue and J. H. Rushton. *Chem. Engng Progr.*, June 1952, **48** (6), 297–306.—Constructional details and performance data are presented for a continuous countercurrent extraction column, composed of a 6-inch dia, vertical glass tube, compartmented by horizontal plates, agitated by mixing impellers on a vertical shaft, and baffled by vertical members. The column's performance was evaluated for the system methyl *iso*butyl ketone, water, and acetic acid using different sized compartments, impellers, impeller positions, and speeds, acid concn, and feed rates. Settling zones were provided above and below the mixing-extracting compartments, and no coalescence was allowed between compartments.

Best stage efficiency showed a minimum height for a theoretical contact stage of 3·7 inches for a throughput of 2140 lb/(hr.) (sq. ft.) using 8 compartments each 3 inches high, corresponding to a stage efficiency of 81%. Comparison with performance of other types of extraction columns shows high efficiency at moderate throughput rates, extreme flexibility, and ease of maintenance. J. G. H.

260. A pilot plant evaporator and distillation unit. J. A. Wheat. *Canad. J. Tech.*, 1953, **31**, 42–56.—A description of the unit, its instrumentation, and operation as a single stage and 3-stage evaporator of fermented molasses mashes is given. The continuous recovery and purification of 2 : 3-butanediol from aq soln is also described. J. G.

261. To help you design fractionators. Pt 6. Distillation of ternary mixtures. R. R. White. *Petrol. Process.*, 1953, **8** (8), 1174–9.—Discussion is continued for the case of partially distributed components. The stage to stage calculations for the max value of L/V for a column with infinite stages in the rectifying are illustrated by means of the 90° triangular diagram. Other cases are taken where minimum and intermediate reflux conditions exist.

The importance of the fractionation envelope in understanding the dist process is continually stressed. J. W. H.

262. To help you design fractionators. Pt 7. Distillation of quaternary mixtures. R. R. White. *Petrol. Process.*, 1953, **8** (9), 1336–9.—The case of quaternary mixtures with completely distributed components is discussed. The simplest method of specifying the separation is developed first, and a specific example is considered. In the example the minimum No. of stages are found at total reflux, and the minimum reflux ratio that can be used with an infinite number of stages is calculated. J. W. H.

263. Industrial viewpoints on separation processes. K. H. Hachmuth. *Chem. Engng Progr.*, Oct. 1952, **48** (10), 523–7; Nov. 1952, **48** (11), 570–4; Dec. 1952, **48** (12), 617–26.—The recognition of the analogous nature of separation processes can materially facilitate the application of such processes to specific problems. Basic similarities and distinguishing characteristics of the main separation processes are discussed, together with generalizations which, while specifically referring to fractional dist, have a common application to separation processes. In Pt 2 separation calculations are reviewed.

The method of calculating an azeotropic dist is illustrated by means of the M.E.K.–*n*-heptane–toluene system, this being selected because of the availability of phase-equilibrium

data. The possibilities of the concept of basic similarity as outlined in Pt 1 in the solution of unfamiliar problems and as a short cut in the solution of others are indicated, together with the scope and applications of the absorption factor method. J. G. H.

264. Patent. U.S.P. 2,626,894 (25.8.48; 27.1.53). J. S. Palmer, assr to Standard Oil Development Co. Dist towers to which are charged superheated hydrocarbon vapours maintained coke-free by providing the inlet line to the tower with a restriction at the point where it enters the tower. The restriction may be an artificial obstruction welded to the upper interior surface of the inlet line, or it may be provided by constricting the inlet line to reduce the area of flow to *ca* half the area of flow of the inlet line. The restriction increases the velocity of the vapours, and by also maintaining the temp above the dew point of the vapours, coke formation is prevented. If the dew point should be reached, the restriction causes the droplets of liq to be swept off immediately before coke can form therefrom. V. P. P.

ABSORPTION AND ADSORPTION

265. Refining with adsorbents. Pt IV. V. A. Kalichevsky and K. A. Kobe. *Petrol. Refin.*, 1953, **32** (9), 215–18.—An account of the use of clays in contact processing and of the methods of regeneration of spent clay, including the use of solvents. R. D. S.

266. Granular desiccants for drying liquids by adsorption. W. E. Smith and M. Leva. *Petrol. Process.*, 1953, **8** (8), 1194–9.—Organic liq such as benzene, toluene, propane, etc., can be dried by the use of granular desiccants; this process of drying offers an economic method for the removal of water from liq hydrocarbons, where high purity is desired and the water content is relatively low.

The adsorbents used in this process are numerous, the more important are: activated alumina, silica gel, florite, and activated bauxite. In addition to these, there are many inorganic salts that will take up water to form hydrates. Liq drying seems to be a selective operation, and it appears that certain classes of liq are treated best with specific adsorbents. The general properties of absorbents in relation to liq properties may well constitute the key to optimum design. From a mechanical point of view, liq dryers are characterized by low pressure drops and power costs.

The paper describes the adsorption–regeneration cycle in the dual-type unit, and presents design details of proven standard installations. J. W. H.

267. Patents. U.S.P. 2,626,675 (2.12.49; 27.1.53). J. L. Maher, assr to National Tank Co. A sorbing tower, particularly of the type adapted to be reactivated by a stream of heated gas, in which the gas is introduced through a central flume and passes radially outwardly through the bed of sorbent material, thereby avoiding the disadvantages of heat radiation from the outer shell of the tower, and cooling of the used reactivation gas is obtained by passing it in heat exchange relationship with the tower shell. V. P. P.

U.S.P. 2,650,155 (15.7.51; 25.8.53). W. V. Medlin, assr to Shell Development Co. Apparatus for stripping and regenerating spent adsorptive powders. D. A. R.

CRACKING

268. Hydrocarbon reforming processes. H. E. Bramston-Cook. *Chem. Engng Progr.*, Aug. 1952, **48** (8), 381–4.—The historical background of the aromatic hydrocarbon chemicals industry in the U.S. is briefly summarized, and the importance of coal tar as a raw material in the period between the wars is indicated. The characteristics of the hydroforming, Platforming, and Houdriforming processes are described, together with wartime methods for the production of toluene and later practice in benzene production. J. G. H.

269. A look at commercial catforming. H. R. Grane. *Petrol. Refin.*, 1953, **32** (9), 112–14.—An account of the first 12 months operation of the catforming unit at Malco refinery in Prewitt, New Mexico. So far, 50 brl of naphtha have been processed for each lb of cat without regeneration and with no appreciable change in cat activity. R. D. S.

270. Aromatics from petroleum. D. S. Maisel. *Petrol. Process.*, 1953, **8** (8), 1185–92.—A review of the following 5 possible routes for producing aromatics from petroleum is presented; (1) recovery from crude petrol; (2) dehydrogenation of naphthenes; (3) ring closure of paraffins; (4) cracking–polymerization–cyclization of aliphatic hydrocarbons; (5) alkylation of lower aromatics.

The effect of the alternate processes to fixed-bed hydroforming of the production of aromatics is discussed, and shows a possible high increase in yields of aromatics for the future. The progress made since the first world war on recovery processes, dist, and liq–liq extraction processes has led to recoveries in the region of 95–99% at purities of 96–99%.

Short accounts are given of the main aromatics in present demand with regard to their recovery and purification. J. W. H.

271. Metals poisoning of fluid cracking catalyst. B. J. Duffy and H. M. Hart. *Chem. Engng Progr.*, July 1952, **48** (7), 344–8.—The effect of cat quality on yield in cat cracking is considered, together with cat poisoning and the relation between cat selectivity, deterioration, and marginal contaminating feed stock. Experience with a fluid cat cracking unit providing data on the contaminating effects of metal in cracking feed is reported, and carbon factor as a measure of cat selectivity is explained. The effects of various feeds on carbon factor, the effect of carbon factor on gasoline yield, and the prediction of cat requirements for carbon-factor control are discussed. J. G. H.

272. Plastic solves scrubbing problems. D. P. Thornton. *Petrol. Process.*, 1953, **8** (9), 1328–30.—Eastern States Petroleum Co have found that porous, permeable plastic scrubbers, placed in a recycle hydrogen stream leading to a cat reforming unit, will take out unwanted liq satisfactorily. The principle involved appears to be the coalescence of tiny droplets. The same technique will also coalesce entrained water in gasoline.

The 3 coalescers in use each consist of a 20-ft section of 12-inch steel pipe containing a plastic "finger." Each "finger" is made up of 10 plastic cyl, 4 inches × 2½ inches inside dia × 24 inches long, mounted end to end. The plastic is reported to be of the phenol–formaldehyde resin type. The pore size is sufficiently small to effectively remove liq and solid particles from 5–50 microns. Strong alkalis will damage the plastic, but it is generally resistant to acids and alkalis below pH 11. Flow capacity is high and press drop low. In general, a coalescer having 20,000 mD permeability will pass 2 gal water/hr/sq. in. with a press drop of approx 1·5 p.s.i. J. W. H.

273. Patents. U.S.P. 2,625,504 (28.3.51; 13.1.53). V. Haensel and C. F. Gerald, assrs to Universal Oil Products Co. Gasoline reforming cat comprising alumina, boron oxide, and 0·01 to 2 wt % of platinum or palladium.

U.S.P. 2,626,245 (22.7.49; 20.1.53). A. V. Grosse. Oxidn of CO to CO_2 during regeneration of cracking cat is restricted by contacting the cat with a mixture of an oxidizing gas and an oxidn suppressor comprising chlorine or bromine and a bromide of Si, Zr, Ti, or Al.

U.S.P. 2,626,857 (18.2.47; 27.1.53). J. A. Crowley, assr to Socony-Vacuum Oil Co. Apparatus for conversion of high boiling hydrocarbons *A* consists of a vertical elongated vessel divided by a partition into an upper vaporizing chamber in which *A* is vaporized by contacting with solid heat absorptive particles, the resulting vapour passing via a passage into a lower final conversion chamber, where it is contacted with a particle-form cat.

U.S.P. 2,624,695 (28.7.50; 6.1.53). E. H. Ivey and J. W. Delaplaine, assrs to Houdry Process Corpn. Elevation by a gaseous medium of granular materials of particle size $\leqslant$14 mesh employed in a conversion process, as a relatively conc stream in substantially straight line flow free from turbulence.

U.S.P. 2,625,442 (17.1.51; 13.1.53). R. Kollgaard, assr to Houdry Process Corpn. Apparatus for elevating granular material pneumatically in systems comprising multiple lift pipes.

U.S.P. 2,626,893 (28.3.49; 27.1.53). M. R. Morrow, assr to Standard Oil Development Co. A fraction *A* consisting substantially of aromatic, paraffinic, naphthenic, and olefinic hydrocarbons, b.p. 200°–250° F is dist to obtain a fraction *B* b.p. 220°–245° F of improved octane no characteristics suitable for inclusion in aviation gasoline. *A* may be obtained by hydroforming a fraction b.p. 200°–325° F containing aromatic, naphthenic, and paraffinic, and, if desired, olefinic hydrocarbons.

U.S.P. 2,641,573 (30.11.50; 9.6.53). J. Weikart, assr to Standard Oil Development Co. Production of motor fuel by dist crude pet to produce a heavy naphtha *A* of b.p. 200°–450° F and a gas oil fraction *B*. *B* is cracked in presence of a dense fluidized cracking cat under motor fuel producing conditions, the cat being regenerated and recycled and the cracked products being withdrawn and fractionated to separate a motor fuel fraction and a cycle oil of b.p. >700° F. At least a major portion of the cycle oil is combined with *A* to produce a mixture containing 20–80 vol % of *A*, which is passed in vapour phase through a narrowly confined path at 1000°–1200° F/300–600 p.s.i.g. and residence times corresponding to throughputs of 5–20 v/v/hr in presence of finely divided cat suspended in the mixture in the proportion of 2–30 lb cat/liq brl of mixed feed, motor fuels being recovered from the product.

U.S.P. 2,641,582 (3.10.50; 9.6.53). V. Haensel, assr to Universal Oil Products Co. A carbonized cat, comprising alumina, 0·01–1 wt % platinum, and 0·1–8 wt % halogen is reactivated by treating with air at 500°–700° F for 6–30 hr and then at 800°–1000° F for 1–6 hr.

U.S.P. 2,641,583 (15.10.48; 9.6.53). J. L. Gring, assr to Sinclair Refining Co. Producing silica gel spheres in oil by spraying a stable aq soln of sodium silicate above an oil saturated with SO_2, the sprayed droplets falling into the oil. V. P. P.

U.S.P. 2,647,860 (16.11.49; 4.8.53). C. J. Plank and R. C. Hansford, assrs to Socony-Vacuum Oil Co. A process for continuous cat conversion of heavier hydrocarbons by cat cracking to hydrocarbons within the gasoline boiling range, by using as cat a particle-form composite of silica, alumina, and chromium oxide in which the chromium oxide constitutes from *ca* 0·01 to *ca* 1·0% by dry wt. D. A. R.

HYDROGENATION

274. High-pressure hydrogenation of crude shale oil. M. G. Peloipetz, M. L. Wolfson, H. Ginsberg, and E. L. Clark. *Chem. Engng Progr.*, July 1952, **48** (7), 353–6.—Crude shale oil, from retorting Colorado oil shale in a gas-flow retort, was hydrogenated over several solid cats in a continuous high-pressure unit on a once-through basis. At 9000 p.s.i. gauge hydrogen pressure and at a temp of 800°–900° F an oil essentially free from sulphur and nitrogen and suitable for further processing by conventional methods is obtained. Using tungsten or cobalt molybdate cats 40–50 vol % of the product obtained by hydrogenation can be utilized as high quality diesel fuel, with cetane ratings of 50–60. Hydrogen consumption, depending on the type of cat used and the temp of operation, varies from 2000 to 2800 cu. ft/brl of shale oil feed. J. G. H.

275. Selective hydrogenation. H. W. Fleming, W. M. Keely, and W. R. Gutmann. *Petrol. Refin.*, 1953, **32** (9), 138–41.—A discussion of the data obtained from lab and pilot plant work on the removal of acetylene from gas streams by selective hydrogenation. Using an undisclosed cat the acetylene content in ethylene streams can be reduced to below 10 p.p.m. R. D. S.

276. Patents. U.S.P. 2,638,438 (1.9.50; 12.5.53). E. J. Hoffman and E. F. Wadley, assrs to Standard Oil Development Co. Naphthas boiling in the gasoline range and containing mono- and di-olefins, are hydrogenated so that the di-olefins are selectively hydrogenated by adding 0·1–1·0% of an aliphatic mercaptan of 1–4 carbon atoms or of a thiophenol boiling up to 450° F, contacting the naphtha with a sulphur insensitive hydrogenation cat at 400°–600° F and at a pressure of 45–500 p.s.i.g. in the presence of hydrogen, and removing the sulphur compounds by extraction with a soln of an alkali metal hydroxide.

U.S.P. 2,638,454 (22.8.50; 12.5.53). R. Rowan, assr to Standard Oil Development Co. Hydroforming cat is made by impregnating alumina trihydrate with a soln of a salt of molybdenum and a salt of cobalt, iron, or nickel, heating for 4–8 hr at 1100°–1200° F, mixing with a plastic clay and heating for a further 4–8 hr at 1100°–1200° F.

U.S.P. 2,639,982 (30.4.49; 26.5.53). J. C. Kalbach, assr to Hydrocarbon Research Inc. Hydrogenation of solid carbonaceous material (I), by slurrying it with a liq hydrocarbon (II), and treating the slurry with a hydrogen-rich gas in a hydrogenation zone, the gas and vaporized (II) maintaining (I) in a fluidized state.

U.S.P. 2,640,009 (20.12.49; 26.5.53). C. W. Montgomery and C. S. Brown, assrs to Gulf Research and Development Co. Hydrocarbon vapours are treated with hydrogen in the presence of a cat prepared by treating a hydrogenation cat composited with a cracking cat, with wet steam at 350°–550° F for a period of at least ½ hr. J. M. S.

POLYMERIZATION

277. Patents. U.S.P. 2,637,720 (30.9.49; 5.5.53). H. G. Schneider and P. W. Brakeley, assrs to Standard Oil Development Co. Low mol. wt. *iso*butylene polymers are made by fractionating a light cracked petroleum fraction containing *iso*butylene and butenes, separating a naphtha overhead having a reduced butene-2 content, and polymerizing the naphtha with boron fluoride at below 0° C in the presence of 0·1% of ether.

U.S.P. 2,638,464 (16.12.49; 12.5.53). W. B. Reynolds, J. E. Wicklatz, and T. J. Kennedy, assrs to Phillips Petroleum Co. Synthetic rubber is made by the emulsion polymerization of 1 : 3-butadiene and styrene at 10° to −40° C and at a pH of 9–12 in presence of an alkali metal soap emulsifying agent, an alkyl mercaptan, dimethyl (chlorophenyl) hydroperoxymethane, an alkali metal ferrous pyrophosphate complex, and a reducing sugar.

U.S.P. 2,639,270 (21.12.49; 19.5.53). J. R. Caldwell, assr to Eastman Kodak Co. Compounds containing an olefinic group are polymerized in an aq soln containing a polymerization cat and an alkali metal aromatic sulphonate. J. M. S.

U.S.P. 2,640,819 (29.4.50; 2.6.53). G. R. Barrett, assr to Monsanto Chemical Co. A mixture of styrene (1–1·5 mol) and maleic anhydride and/or an alkyl half ester of maleic acid (1 mol) is subjected to free radical inducing conditions in presence of 0·01–2 wt %, based on monomers, of 2 : 5-di*tert*-butyl-*p*-benzoquinone.

U.S.P. 2,640,821 (16.12.46; 2.6.53). J. H. Pritchard and C. F. Fryling, assrs to Phillips Petroleum Co. Copolymerization of 1 : 3-butadiene with a minor amount of styrene at −10° to +60° C in presence of 0·2–0·4 parts of *p*-methoxyphenyl diazothio-(2-naphthyl) ether and 0·24–0·3 parts of a C_{12-16} *tert*-alkyl mercaptan per 100 parts by wt of the monomers, as the sole activators and modifiers present.

U.S.P. 2,641,620 (18.3.50; 9.6.53). J. R. Quelly and S. A. Sankus, assrs to Standard Oil Development Co. Preparation of low sulphur content dimers and trimers by selective sulphuric acid absorption and polymerization of *iso*butylene in which the polymers are percolated through activated charcoal, caustic neutralized, and dist.

U.S.P. 2,641,614 (2.1.51; 9.6.53). E. C. Britton and P. S. Petrie, assrs to Dow Chemical Co. A mixture of polyglycols of average mol. wt. $\leqslant 300$ is obtained by heating 0·1–9 mol styrene oxide with 1 mol of a C_{2-4} alkylene oxide in liq phase with 1–10 wt % of a glycol and 0·1–0·5% of an alkali metal hydroxide, at 80°–200° >1 atm. V. P. P.

U.S.P. 2,650,151 (22.4.50; 25.8.53). G. E. Ham, assr to Chemstrand Corpn. A copolymer of at least 80% by wt of acrylonitrile and from 2–20% of allyl glycidyl ether, methallyl glycidyl ether, or β-chloroallyl glycidyl ether.

U.S.P. 2,650,163 (21.5.47; 25.8.53). E. F. Horsey and W. D. Thompson, assrs to Hercules Powder Co. A paper, characterized by high sizing and wet strength, comprising cellulosic fibrous material and a high styrene copolymer of butadiene and styrene distributed substantially uniformly throughout the fibrous material.

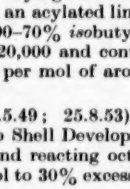
U.S.P. 2,650,206 (25.4.50; 25.8.53). R. P. Stock, assr to B. F. Goodrich Co. A coating composition comprising 20–60 % by wt based on the total wt of the coating composition of a rubbery polymer of chloroprene, a volatile liq diluent, a carbohydrate, and a foaming agent which is aluminium sulphate, ammonium sulphamate, ammonium sulphate, monoammonium phosphate, diammonium phosphate, phosphoric acid, ammonium bromide, zinc chloride, boric acid, or sodium tungstate.

U.S.P. 2,650,208 (18.10.49; 25.8.53). W. F. Arey and R. E. Wood, assrs to Standard Oil Development Co. A high mol. wt. elastomeric polymerization product of a feed containing at least a major proportion of a mono-olefin or a C_4–C_{14} olefin which is normally subject to deterioration in the presence of oxygen, which contains in admixture therewith a small quantity, sufficient to substantially reduce such deterioration, of the condensation product prepared by reacting a diolefin and a polyhydric phenol in the presence of a hydrate of ferric chloride, the condensation product containing 2 aromatic nuclei.

U.S.P. 2,650,209 (1.12.50; 25.8.53). J. F. Nelson and A. H. Gleason, assrs to Standard Oil Development Co. A process for preparing a drying oil which comprises condensing a *cyclo*pentadiene with an acylated linear copolymer of about 10–30% styrene and 90–70% *iso*butylene having a mol. wt. between *ca* 1000 and 20,000 and containing *ca* 0·2–1 mol of combined acyl groups per mol of aromatic styrene nuclei of the copolymer chain.

U.S.P. 2,650,211 (2.5.49; 25.8.53). H. Dannenberg and J. R. Scheibli, assrs to Shell Development Co. A polyester obtained by heating and reacting octadecenylsuccinic anhydride with an equal mol to 30% excess of diethylene glycol.

U.S.P. 2,650,215. F. Strain, assr to Columbia–Southern Chemical Corpn. A copolymer of (*a*) a polymerizable ester of a polybasic acid which is free from aliphatic unsaturation and an unsaturated C_3–C_{10} monohydric alcohol having an aliphatic polymerizable unsaturated carbon to carbon linkage between the β and γ carbon atoms, and (*b*) a maleimide which has the general structure



where R is hydrogen or an organic radical linked to the nitrogen through carbon; the concn of the maleimide being $\leqslant 5\%$ of the weight of the ester and up to 75% of the total polymerizable components. D. A. R.

ALKYLATION

278. New developments in sulphuric acid alkylation. D. H. Putney and O. J. Webb. *Petrol. Refin.*, 1953, **32** (9), 104–7.—A description of the use of effluent refrigeration, wherein some unreacted *iso*butane is recovered from the reaction products by a reduction in pressure and the remaining cooled liq used to cool the reactor. This greatly reduces the load on the de-*iso*butanizer which supplies only *ca* 30% of the total *iso*butane recycled, thus reducing the fractionation requirements and the operating costs while maintaining a high *iso*butane concn in the reactor. R. D. S.

279. Patents. U.S.P. 2,637,750 (14.7.49; 5.5.53). F. M. Smith and R. S. Hanmer, assrs to Phillips Petroleum Co. Monoalkyl aromatic hydrocarbons are made by fractionating an olefin concentrate having a boiling range of 350°–500° F into a number of fractions, separately alkylating the aromatic hydrocarbons with each fraction, separately fractionating each of the alkylates into monoalkyl aromatic hydrocarbons and polyalkyl aromatic hydrocarbons, and finally mixing all the monoalkyl fractions.

U.S.P. 2,639,286 (29.7.48; 19.5.53). J. M. Mavity, assr to Universal Oil Products Co. Thiophenes and furans are alkylated in presence of a cat prepared by reacting boric acid and a metal halide of the Friedel–Crafts type.

U.S.P. 2,639,303 (30.12.49; 19.5.53). C. B. Linn and G. L. Hervert, assrs to Universal Oil Products Co. Mixtures of paraffin and aromatic hydrocarbons are extracted with anhydrous hydrogen fluoride containing silver, gold, platinum, palladium, or mercury fluoride, cyanide or nitride to extract the aromatics, and the extract is contacted with an olefin at $-30°$ to $+30°$ C to alkylate the aromatics. J. M. S.

CHEMICAL AND PHYSICAL REFINING

280. Design and choice of equipment for gas dehydration. J. M. Campbell. *Chem. Engng Progr.*, Sept. 1952, **48** (9), 440–8.—The 4 methods in general use for the dehydration of natural gas, dry dessicant plants, glycol absorption, expansion refrigeration, and glycol injection are outlined with summaries of operating characteristics, descriptions of equipment used, and details of specific advantages; a detailed cost comparison of the 4 systems is also presented. J. G. H.

281. Does crude oil source affect desulphurization? J. H. Gary and H. E. Scheweyer. *Petrol. Refin.*, 1953, **32** (9), 225–8.—A report of an investigation into the effect of crude source on the manner of desulphurization by the cobalt–molybdate cat process. Results indicate that only the original sulphur content, and not the crude source, affects the amount of desulphurization, and that the rate is greatest for paraffinic and least for aromatic types of compound. R. D. S.

282. Patents. U.S.P. 2,637,749 (28.12.48; 5.5.53). J. G. Aston and R. E. Black, assrs to Phillips Petroleum Co. Method of isolating a pure component (I) from a multicomponent mixture (II) containing I, which comprises freezing II to obtain a substantial proportion of I in solid form, subjecting the solid to at least one fractional fusion step, holding the resulting solid and liq phases in mutual contact under adiabatic conditions until phase equilibrium is reached, and withdrawing the liq to leave I. The process is applicable to the purification of *cyclo*hexane.

U.S.P. 2,638,439 (18.4.51; 12.5.53). J. G. Browder and A. R. Smith, assrs to Standard Oil Development Co. Sour pet dist containing mercaptans are sweetened by adding a cat amount of an organic fraction (I) and contacting with a cat amount of a soln of an alkali metal hydroxide and a sufficient amount of a mild oxidizing agent to convert the mercaptans to disulphides. I is obtained by acidifying a soln of an alkali metal salt of crude pet phenols to at least 75% of a methyl orange end point, discarding the phenols released, acidifying the remaining soln to the methyl orange end point, and separating the organic fraction.

U.S.P. 2,639,260 (14.7.50; 19.5.53). R. M. Kennedy and A. Schneider, assrs to Sun Oil Co. Non-hydrocarbons are removed from hydrocarbons by treating the mixture with boron fluoride and a primary or secondary alkyl monofluoride. The non-hydrocarbons are converted to a sludge.

U.S.P. 2,639,261 (14.7.50; 19.5.53). R. M. Kennedy and A. Schneider, assrs to Sun Oil Co. Aromatic hydrocarbons are separated from mixtures with saturated non-aromatic hydrocarbons by the process of U.S.P. 2,639,260.

U.S.P. 2,639,262 (14.7.50; 19.5.53). R. M. Kennedy and A. Schneider, assrs to Sun Oil Co. Similar to U.S.P. 2,639,260, except that a *tert*-alkyl monofluoride is used.

U.S.P. 2,639,304 (11.1.52; 19.5.53). F. P. Hazlett, assr to Jones and Laughlin Steel Corpn. The % of paraffins in liq aromatic hydrocarbons produced from coal is reduced by treating with anhydrous aluminium chloride and α-picoline.

U.S.P. 2,640,010 (8.11.51; 26.5.53). C. O. Hoover, assr to Air Reduction Co. Sulphur compounds are removed from pet hydrocarbons by oxidizing in the vapour phase in the presence of a cat containing cuprous sulphide.

U.S.P. 2,640,011 (17.11.50; 26.5.53). R. B. Mason and H. J. Rose, assrs to Standard Oil Development Co. Heavy pet oils are desulphurized by contacting them with hydrogen in the presence of the tetrachloride of tin or titanium at 300°–900° F and at a pressure of 100–5000 p.s.i.

U.S.P. 2,640,012 (10.10.51; 26.5.53). C. Wankat and E. Y. Titus, assrs to Universal Oil Products Co. In the sweetening of sour hydrocarbon dist by adding a phenylenediamine inhibitor and treating with an alkali metal hydroxide soln, the used soln is separated into 2 layers and the lower layer re-used.

U.S.P. 2,640,051 (4.12.50; 26.5.53). C. S. Lynch, assr to Phillips Petroleum Co. Process for the decomposition of urea and thiourea adducts. J. M. S.

U.S.P. 2,640,802 (G.B. 16.11.49; 2.6.53). F. W. B. Porter and R. P. Northcott, assrs to Anglo-Iranian Oil Co. Sulphur- and naphthene-containing cracked pet naphtha *A* is desulphurized without materially affecting the properties of the naphtha by passing *A* at a space velocity of 0·5–1·0 v/v/hr into contact with a dehydrogenation–hydrogenation cat at 780°–800° F and 25–75 p.s.i.g., the temp and pressure being correlated to provide from the dehydrogenation of the naphthenes an amount of hydrogen at least equal to, but not substantially in excess of, that required to convert organic sulphur compounds into H_2S and to supply the hydrogen requirements of the reaction zone *B*. A hydrogen-rich gas is separated from the treated product and recycled to *B* at a rate of 1000–4000 cu. ft/brl, at which the necessary partial pressure of hydrogen will be maintained in *B*.

U.S.P. 2,641,570 (4.3.50; 9.6.53). H. A. Ricards, B. M. Vanderbilt, and E. Arundale, assrs to Standard Oil Development Co. A virgin pet naphtha is sweetened by agitating it with aq NaOH of concn 0·5–10 wt % containing 0·05–1% alkali metal rosinate and 0·05–0·5% pet phenols in presence of an oxygen-containing gas and cooling the resulting emulsion to 10°–50° C to effect separation of aq and oil phases.

U.S.P. 2,641,571 (31.12.49; 9.6.53). K. E. Leutz, assr to Sun Oil Co. H_2S is removed from a light mineral oil dist by contacting in liq phase with an aq soln of an iron salt having a weakly acidic org anion and a water-solubility at room temp >10 g/l. The iron sulphide formed is converted to the original iron salt and sulphur by treatment with a free oxygen-containing gas.

U.S.P. 2,641,572 (30.11.51; 9.6.53). J. L. Meadows, R. H. Howell, A. J. Startz, and G. H. Miller, assrs to Texas Co. Dethiolizing process in which hydrocarbons are contacted with a soln of alkali metal hydroxide and glycol ether, a cyclic flow of which is maintained between the dethiolizing zone and a regenerating zone. A portion of the soln is withdrawn and mixed with the hydrocarbon feed to leach out the glycol ether, the separated alkali being withdrawn.

U.S.P. 2,641,533 (6.11.50; 9.6.53). M. R. Cines and W. T. Nelson, assrs to Phillips Petroleum Co. A furnace carbon black of pH 8·5–10·1 is contacted with an oxyhalide of nitrogen, sulphur, or phosphorus at from normal temp to 400° F to reduce the pH and thereby increase the scorch time of rubber mixes in which it is compounded.

U.S.P. 2,641,535 (14.4.49; 9.6.53). M. R. Cines, assr to Phillips Petroleum Co. High pH furnace carbon black is pelleted while in contact with a free oxygen-containing gas containing 0·01–5 vol % of sulphur dioxide at <32° F, the resulting pellets having a pH 3–7.

U.S.P. 2,641,569 (Neth. 26.7.51; 9.6.53). W. M. Mazee and A. B. Swart, assrs to Shell Development Co. Method of sweating a cake of paraffin wax having a wax skeleton with an original pore volume *A* wherein the temp between 90°–150° F is raised by 0·025°–0·075° F/min under a pressure on the cake of 0·3–15 p.s.i. *A* is thereby varied by >10% until <90% of the sweated constituents are removed. V. P. P.

U.S.P. 2,647,653 (6.5.48; 4.8.53). W. W. Greene An oil filtering cartridge comprising a plurality of layers of filtering material, one of the layers being a granular filtering material, and means for preventing oil passing through the casing from forming defined paths through the last named layer.

U.S.P. 2,647,637 (16.7.49; 4.8.53). J. M. Leet, assr to General Motors Corpn. A filter having a fluid inlet chamber and a fluid outlet chamber, and a pair of substantially parallel filter strips spirally wound with a first passage between the strips and a second passage between the convolutions of the spiral.

U.S.P. 2,647,857 (4.10.49; 4.8.53). W. A. Horne, assr to Gulf Research and Development Co. Hydrodesulphurizing a petroleum hydrocarbon by passing the petroluem hydrocarbon and a hydrogen containing gas into an enclosed chamber which contains as a contact agent, iron group metals, iron group metal oxides, or mixtures thereof, and oxidatively regenerating the contact agent to restore it substantially to its original form.

U.S.P. 2,648,623 (G.B. 8.4.49; 11.8.53). F. W. B. Porter and R. P. Northcott, assrs to Anglo-Iranian Oil Co. In a continuous process for the hydrocatalytic desulphurization of a sulphur and naphthene-containing hydrocarbon oil wherein the oil is contacted in a reaction zone at an elevated temp and pressure in the presence of hydrogen with a dehydrogenation–hydrogenation cat which is immune to sulphur poisoning and combines activity for the dehydrogenation of naphthenes to aromatics with activity for the hydrogenation of organically combined sulphur in the oil to hydrogen sulphide, the method of operating the process so that it will be self-supporting with respect to the amount of hydrogen needed and produce product oil having, except for lowered sulphur content, properties and boiling range substantially the same as the feedstock.

U.S.P. 2,648,624 (10.2.51; 11.8.53). H. V. Hess, G. B. Arnold, and L. Kovach, assrs to Texas Co. Concentrating aromatic hydrocarbons, including naphthalene, from hydrocarbon stocks boiling within a range of 300°–500° F and containing non-aromatic hydrocarbons and aromatic hydrocarbons, including naphthalene, by subjecting such hydrocarbon stock in the absence of steam to an azeotropic dist with furfural in a binary azeotropic dist zone. D. A. R.

SPECIAL PROCESSES

283. Wulff process. N. C. Updegraff and J. C. Reynolds. *Petrol. Refin.*, 1953, **32** (9), 162–5.—Presents some cost data on the Wulff process for the production of acetylene from hydrocarbon gases and describes the separation system which uses absorber oil to remove the higher acetylenes and dimethyl formate to absorb acetylene. R. D. S.

284. Houdry dehydrogenation process. G. F. Hornaday. *Petrol. Refin.*, 1953, **32** (9), 131–2.—A description and flow diagram of the process and a summary of the operating conditions, yields, and economics of butadiene production by this process. R. D. S.

285. Fluid coking process. Anon. *Petrol. Refin.*, 1953, **32** (9), 102–3.—A brief description of the Standard Oil Co's process for the continuous production of coke, gas oil, and gasoline from residual oils or low quality crudes. Some of the coke produced is recycled as fluidized cat, and some is burned to provide heat for the process. A typical flow sheet is given. R. D. S.

286. New fluid coking process. Anon. *Petrol. Process.*, 1953, **8** (9), 1316–17.—This new fluid coking process is very similar to fluid cat cracking with one main difference, that is, coke particles replace cat in the reactor and, in place of the regenerator, a coke burner burns enough of the particles to provide heat for the process, coke is withdrawn continuously to maintain the proper inventory in the system, and the remaining hot coke carries heat back to the reactor. The process is not cat. Advantages of this new process are said to be lower investment and operating costs.

The crude oil residuum to be coked is injected into a fluidized bed of coke particles in the reaction vessel, the temp of which is *ca* 950°–1050° F. The coke produced in the process has the appearance of black coarse beach sand. Residual oils with initial b.p. as low as 600°–700° F can be handled, as well as vac residua with 1100° F i.b.p. or higher. Feed stocks with gravities as low as 1·8° API or heavier have been processed. J. W. H.

287. Fluidization of solid particles in liquids. E. W. Lewis and E. W. Bowerman. *Chem. Engng Progr.*, Dec. 1952, **48** (12), 603–10.—Flow characteristics for batch fluidization of fine non-uniformly sized solids in liq (3a cracking cat in hydrocarbons) have been investigated and are compared with results when constant dia glass spheres are used in the same region of flow resistance (Stokes' law region) previously reported by other investigators. Previously published results of batch liq–solid fluidization systems in the intermediate and Newton's law regions are used to develop similar correlations, which can be utilized in combination with present results to predict the performance of batch liq–solid fluidization systems. J. G. H.

288. H_2S low but sulphur recovery hig'n. J. F. Mullowney. *Petrol. Process.*, 1953, **8** (9), 1345–7.—A 61-short ton/day plant for the recovery of sulphur has been recently placed on stream on a gasoline plant near Sundown, Texas. The plant uses acid feed gas of very low hydrogen sulphide content—15·5 mol % and operates in conjunction with a gas sweetening unit which removes the acidic contaminants from the natural gas. The gas treating unit uses an aq mono-ethanolamine soln as an absorption medium, removing approx 8 million cu. ft/day of acid gases which constitute the sulphur unit's feed stock.

The unit is capable of removing 92% of the sulphur available in the acid feed gas, approx 88% of this amount being cat converted in the primary cat bed. J. W. H.

289. New developments in amine gas treating. Anon. *Petrol. Refin.*, 1953, **32** (9), 124.—A short account of the Fluro glycol–amine process for purification and dehydration of gas streams; the use of methyl–diethanolamine for selective removal of CO_2, and of the replacement of diethanolamine by mono-ethanolamine because of the ease of regeneration. R. D. S.

290. Three electric processes. Anon. *Petrol. Refin.*, 1953, **32** (9), 125–7.—Descriptions and flow diagrams of Petreco's processes for dist treating, fuel oil desaponification, and lub oil treating, all of which use electric fields for the coagulation and separation of the reagent phase from the hydrocarbon. R. D. S.

291. Ethylene oxide by direct oxidation. R. Landau. *Petrol. Refin.*, 1953, **32** (9), 146–9.—An economic comparison is made between the direct oxidn and chlorhydrin processes for the production of ethylene oxide, showing the former to be cheaper because of lower material costs. A discussion of the effect of major variables and of the choice between fixed and fluidized-bed operation is also given. R. D. S.

292. Mechanized dewatering for drier, cleaner petroleum coke. F. Breese. *Petrol. Process.*, 1953, **8** (8), 1170–2.—A new method of dewatering freshly made coke has been developed by the General Petroleum Corpn, U.S. Coke and coke fines are separated systematically from water through a series of steps. The principal equipment includes a metal bar screen, vibrating screens, settling tank, and a clari-flocculator. The dried coke has a low water content suitable for commercial use, 5–15% of total volume, showing an improvement over the performance of the initial dewatering process which left a water content of about 20% by wt.

Production averages over 1000 tons per day of dried coke (total wt) with only 800 b.d. of water remaining in the coke, from an initial flow of 86,000 b.d. in the water/coke slurry. J. W. H.

293. Patents. U.S.P. 2,626,679 (15.6.49; 27.1.53). E. V. Harlow, assr to Koppers Co. In a process for separating the lightest constituent (H_2) of a gaseous mixture by diffusion in successive units through foraminous boundaries *A*, which are swept on the opposite side by a condensable gas *B* (steam), which tends to pass through *A* into the feed gas *C*, *B* is removed from *C* between successive units so that in each unit, the concn of hydrogen in *C*, and the concn gradient between *C* and *B* are a max. *C* is heated above the condensation temp of *B* entering a unit to avoid condensation of *B* in pores of *A*.

U.S.P. 2,624,657 (12.3.47; 6.1.53). P. K. Anderson, assr to American Metal Co. In a reaction tank for containing a liq, a bottom comprising 2 sets of steps disposed to face one another and extending to the tank perimeter, a plurality of horizontal nozzles on the face of each step constructed and arranged for directing a gaseous substance in a sweeping action across the entire area of the tread of such steps and towards the opposite set of steps, and means for supplying such gaseous substance under pressure to the nozzles.

U.S.P. 2,625,414 (18.12.48; 13.1.53). W. Kranz, assr to E. I. du Pont de Nemours and Co. Sealing element for pressure vessels. The invention is based on the discovery that a packing element comprising a tight-fitting annular diaphragm, engaging a reciprocable element with a clearance of $\geq 0{\cdot}002$ inch, when subjected to a pressure differential of 10,000–50,000 p.s.i. or higher, will retain these pressures for long periods if the diaphragm is so positioned and supported that it can flex to cause a contraction of its inside dia when subjected to the pressure differential.

U.S.P. 2,624,462 (10.2.50; 6.1.53). E. R. Williams. Apparatus for automatically siphoning water from oil and water mixtures.

U.S.P. 2,626,795 (10.9.48; 27.1.53). R. W. Curtis, assr to Babcock and Wilcox Co. Fluid heater of moving bed type characterized by high heat transfer capacity and ability to heat fluids continuously to a uniform high temp, comprising a plurality of separate heat exchange chambers with each arranged to maintain a uniform bed of moving solid, gas pervious, heat transfer material therein as received from and discharged to common containers and to contact the beds of material in each chamber with equal streams of gaseous fluid from a common source, the exterior pellet confining walls of each chamber being maintained within a safe operative temp.

U.S.P. 2,640,808 (5.7.47; 2.6.53). R. C. Ulmer, assr to E. F. Drew and Co. Water for use in cooling towers is treated with SO_2 sufficient to reduce the alkalinity to 10–100 p.p.m. and 8–16 lb/million lb water of an alkali metal polyphosphate–mannuronate *B* is then added. The SO_2 combines with free

oxygen in the water, thus reducing corrosivity, *B* promoting the action of the SO_2 and also reducing scale formation.

U.S.P. 2,640,843 (15.6.48; 2.6.53). L. R. Hill and H. G. McGrath, assrs to M. W. Kellogg Co. Fischer–Tropsch process which comprises passing finely divided iron with an alkali promotor and a mixture of $CO + H_2$ through a first confined passageway *A* to the lower end of an elongated reaction zone *B* of shape factor $\lessdot 10$. Gases are passed upwards through *B* at a linear velocity of $\lessdot 5$ ft/sec to produce a gaseous cat suspension of conc $\gtrdot 35$ lb/cu. ft. Reaction products are withdrawn from the top of *B*, cat is separated, and organic compounds recovered. The cat is passed downwards through a second confined passageway, in which it is stripped and thence to *B* via *A*. The cat is circulated through this circuit at a rate defined by the formula

$$\mathrm{Cr} = \frac{50}{\frac{L}{D} + 5} + 0{\cdot}4$$

where Cr = lb of recycled iron/standard cu. ft. of CO added, *L* = vertical length of *B*, *D* = average dia of *B*, the circuit being maintained at 550°–650° F/50–500 p.s.i.g. with cooling by indirect heat exchange.

U.S.P. 2,640,844 (5.2.47; 2.6.53). H. G. McGrath and L. R. Hill, assrs to M. W. Kellogg Co. High velocity Fischer–Tropsch process in which a mixture of hydrogen and an oxide of carbon is passed at a linear space velocity of $\lessdot 5$ ft/sec upwardly through an elongated reaction zone *A* to produce a suspension of finely divided hydrogenation cat of concn $<$ in dense phase bed of same cat under the reaction conditions. *A* is maintained at $\lessdot 550°$ F to $\gtrdot 650°$ F by indirect heat exchange. A gaseous effluent containing cat is withdrawn from the top of *A* and passed to a separation zone, the pressure drop being $\gtrdot 80$ inch of water. Reaction products are recovered therefrom, and separated cat is returned to the bottom of *A* at a temp within 20° F of the reaction temp.

U.S.P. 2,640,845 (1.5.47; 2.6.53). R. A. Beck and E. E. Sensel, assrs to Texas Co. In a Fischer–Tropsch process in which a mixture comprising H_2 and CO is passed upwardly through a bed of hydrogenation cat in dense fluid phase, uniform distribution of the cat particles through the reaction zone is secured by causing the upflowing stream of gas to contact a plurality of fixed, stationary helical surfaces developed about an upstanding axis and positively mounted against rotation to impart rotational movement, but not upward velocity, to the gas, the spaces between the helical surfaces containing a substantial column of fluidized cat.

U.S.P. 2,641,590 (18.8.50; 9.6.53). E. L. Little, assr to E. I. du Pont de Nemours and Co. Carbon monoxide is reacted with a mono-olefin at $\lessdot 250°$ C/$\lessdot 1{,}000$ atm in presence of an alkali metal, an alkali metal hydride, alkyl, aryl, or aralkyl, sodium or lithium anthracene or sodium acridine.

U.S.P. 2,641,613 (1.7.48; 9.6.53). J. K. Mertzweiller and P. T. Parker, assrs to Standard Oil Development Co. Oxo process in which the cat comprises an inorg cobalt salt dissolved in the aldehydes or alcohols produced in the first stage of the process, the salt being solubilized by an alkyl ether of ethylene glycol.

U.S.P. 2,641,526–7 (12.4.49; 9.6.53). K. E. Leutz, assr to Sun Oil Co. H_2S is selectively removed from gases also containing CO_2 by contacting (*a*) with an aq suspension of $Fe(OH)_2$ of pH $\lessdot 4$, the fouled agent being regenerated by treatment with free oxygen, or (*b*) with an aq soln, pH 4–7, of an iron salt of a weakly acidic organic anion.

U.S.P. 2,641,564 (31.3.48; 9.6.53). C. E. ZoBell, assr to Texaco Development Corpn. Method of, and apparatus for, desulphurizing pet hydrocarbons by contacting with *Desulfovibrio desulfuricans* or *Sporovibrio* in presence of a nutrient medium therefor and of hydrogen.

U.S.P. 2,641,565 (14.4.48; 9.6.53). R. T. Sanderson, assr to Texas Co. Kerogen-type oil shales are subjected to the action of *Clostridium sporogenes*, *C. histolyticum*, *C. lentoputrescens* or *Pseudomonas fluorescens*, or mixtures thereof, in presence of nutrient medium, to facilitate the separation and recovery of hydrocarbons, bituminous substances, etc.

U.S.P. 2,641,566 (15.5.48; 9.6.53). C. E. ZoBell, assr to Texaco Development Corpn. Oil shales, etc., are subjected to the action of *Desulfovibrio desulfuricans* or *Sporovibrio* in presence of a nutrient medium and of oxygen-free hydrogen, to facilitate separation and recovery of hydrocarbons, bituminous substances, etc. V. P. P.

U.S.P. 2.639,275 (28.7.50; 19.5.53). H. H. Vickers and S. E. Jaros, assrs to Standard Oil Development Co. Process for preparing soln of high mol. wt. polymeric materials in oils.

U.S.P. 2,639,293 (16.12.48; 19.5.53). W. W. Crouch, assr to Phillips Petroleum Co. Thioacetic acid and diacetyl sulphide are made by passing hydrogen sulphide and ketene over alumina, charcoal, or molybdenum sulphide at 50°–400° F.

U.S.P. 2,639,296 (4.1.49; 19.5.53). W. W. Crouch and R. T. Werkman, assrs to Phillips Petroleum Co. Manufacture of diacetyl sulphide by a process similar to that described in U.S.P. 2,639,293.

U.S.P. 2,640,015 (20.6.49; 26.5.53). K. J. Nelson, assr to Standard Oil Development Co. Process for carbonizing coal in the form of a dense fluidized mass.

U.S.P. 2,640,016 (31.8.50; 26.5.53). S. W. Martin, assr to Great Lakes Carbon Corpn. Metallurgical coke is made by mixing coking coal with 5–25% pet coke, forming a deep bed of the mixture in a narrow, vertical coking zone and coking by indirect heat at 982°–1204° C.

U.S.P. 2,640,023 (29.12.49; 26.5.53). H. E. Cier, assr to Standard Oil Development Co. Saturated hydrocarbons are reacted together by exposure to a resonance frequency radiation of a wavelength of 2537 Å in the presence of mercury vapour at 80°–650° F at a pressure sufficient to maintain a vapour phase at a residence time of about 4 minutes. The product is a saturated branch chain hydrocarbon having a number of carbon atoms equal to the sum of the carbon atoms in the hydrocarbons reacted.

U.S.P. 2,640,034 (4.6.46; 26.5.53). M. C. K. Jones, assr to Standard Oil Development Co. Production of synthesis gas from solid carbonaceous materials in a finely divided form and steam.

U.S.P. 2,640,069 (Netherlands 12.1.49; 26.5.53). P. W. O. Wijga, assr to Shell Development Co. Aq soln of salts of *sec*-alkylsulphuric acid esters are concentrated by adding sufficient sodium chloride to saturate the soln at 40°–90° C and separating the layers formed.

U.S.P. 2,640,070 (Netherlands 4.7.49; 26.5.53). E. A. M. F. Dahmen, assr to Shell Development Co. Olefins are reacted with a strong polybasic inorganic oxyacid in the presence of an aliphatic hydroxyl compound or a sulphite ester thereof, to form alkyl esters.

U.S.P. 2,640,074 (18.5.49; 26.5.53). W. F. Gresham and A. J. Hill, assrs to E. I. du Pont de Nemours and Co. Butadiene is reacted with carbon monoxide and hydrogen at 135°–200° C under 2500–5000 atm in a liq alkanoic acid medium in the presence of a cobalt compound.

U.S.P. 2,640,085 (G.B. 2.11.48; 26.5.53). L. N. Goldsbrough, assr to Shell Development Co. Manufacture of alcohols by hydrolysis of their esters with inorganic acids. J. M. S.

U.S.P. 2,647,859 (12.8.59; 4.8.53). J. W. Barker, assr to Houdry Process Corpn. Process and apparatus for the disengagement of gases from fluent solid particles in the conversion of hydrocarbons.

U.S.P. 2,649,468 (12.11.47; 18.8.53). M. Benedict, A. C. Faatz, and H. N. Woebcke, assrs to Hydrocarbon Research Inc. Hydrocarbon synthesis process and the production of synthesis gas.

U.S.P. 2,649,469 (29.3.51; 18.8.53). R. F. Neighbors, assr to Eastman Kodak Co. Producing ammonium oleyl sulphate of improved colour and odour from the reaction of oleyl alcohol with sulphamic acid by carrying out the reaction in the presence of morpholine as a cat.

U.S.P. 2,649,477 (G.B. 9.12.49; 18.8.53). D. I. H. Jacobs, D. J. Hadley, and R. H. Sutton, assrs to Distillers Co. Ltd. A process for the manufacture of maleic acid, which comprises oxidizing an unsaturated aliphatic compound of 4–8 carbon atoms in the vapour phase by means a mol oxygen-containing gas in the presence of a cat comprising the oxides of phosphorus and molybdenum, the cat being substantially free from vanadium and its compounds.

U.S.P. 2,649,478 (22.6.49; 18.8.53). J. J. Carnes, assr to American Cyanamid Co. The product formed by condensing under alkaline conditions at an elevated temp at least 6 mol of ethylene oxide with one mol of a primary long chain alkylbenzenesulphonamide.

U.S.P. 2,650,252 (3.7.51; 25.8.53). I. Mankowich, assr to United States Rubber Co. In a method of preparing a composite product of condensation of an aliphatic ketone and a diarylamine, the improvement which consists in adding to the reaction mix a chemical promoter which is a haloalkane, a haloalkene, a halocycloalkane, or a haloalkyl benzene, having in each case a halogen atom directly linked to a saturated carbon atom, the halogen of which has a mol. wt. of at least 35, and heating the mix in the presence of the promoter.

U.S.P. 2,650,253 (27.4.51; 25.8.53). F. F. Rust and W. E. Vaughan, assrs to Shell Development Co. Process of preparing a dialkyl ketone from an olefin and an aldehyde.

U.S.P. 2,650,201 (2.10.50; 25.8.53). J. M. Mavity, assr to Universal Oil Products Co. A process for improving the structural strength of a calcined composite of an acid of phosphorus and a solid supporting material which comprises treating the composite with a hydrolysable compound of titanium, zirconium, or tin.

U.S.P. 2,650,202 (15.2.51; 25.8.53). R. J. Hawes and C. C. Winding, assrs to Tide Water Associated Oil Co. A method for preparing hard granular particles of percolant size from a mass of sub-percolant size particles of a hard granular silicate of an alkaline earth metal replaceable in ionic or base exchange reaction with another alkaline earth metal.

U.S.P. 2,650,204 (G.B. 4.5.49; 25.8.53). P. W. Reynolds and A. A. L. Challis, assrs to I.C.I. Ltd. A process for the preparation of a foraminate cat comprising at least one cat metal which is copper, cobalt, nickel, iron, which comprises treating an alloy of the desired metal and Al or Si with a phenol to extract the Si or Al. D. A. R.

METERING AND CONTROL

294. Valves are in the control loop. E. Wolff. *Petrol. Process.*, 1953, **8** (8), 1180–4.—The design, specification, installation, or maintenance of automatic control valves is in the field of "control loop engineering." It is the growing dependency of industry upon automatic process control that has created a need for a better understanding of the functions of diaphragm motor control valves. This type of valve can be broken down into 2 separate functional units, first, the diaphragm motor which converts a press into a stroke, and second, the valve proper, which changes the flow as a function of stroke.

Each of these 2 units are analysed in detail, giving the essential constructional features in diagrammatic form.

This article deals mostly with spring-type diaphragm motor operators; the springless diaphragm motor has not yet been generally accepted as a stroke-producing unit for control valves. This is due to its inherent inability to take on a definite position should the air supply fail.

The various types of plugs in use on automatic valves are reviewed, and the different steels used in their construction are also given. J. W. H.

295. Patents. U.S.P. 2,625,586 (14.4.50; 13.1.53). J. L. Lander, assr to Bell Telephone Laboratories Inc. Ionization manometer for indicating very low gas pressures. V. P. P.

U.S.P. 2,647,587 (8.6.51; 4.8.53). C. H. O. Berg, assr to Union Oil Co of California. An apparatus for metering the volumetric flow of granular solids. D. A. R.

PRODUCTS

CHEMISTRY AND PHYSICS

296. Volumetric and phase behaviour of decane–H_2S system. H. H. Reamer, F. T. Selleck, B. H. Sage, and W. N. Lacey. *Industr. Engng Chem.* (*Industr.*), 1953, **43**, 1810–12.—Data reported on above system over the range 200–10,000 p.s.i. and 40°–340° F. E. J. C.

297. Phase equilibria in hydrocarbon systems. H. H. Reamer, B. H. Sage, and W. N. Lacey. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1805–9.—Volumetric and phase behaviour of *n*-pentane–H_2S system reported over the range 0–4000 p.s.i. and 40°–460° F. E. J. C.

298. The reactions of active nitrogen with butenes. H. Gesser, C. Luner, and C. A. Winkler. *Canad. J. Chem.*, 1953, **31**, 346–50.—The main products of the reaction of active nitrogen with butene-1, *cis*-butene-2-, and *iso*butene were found to be hydrogen cyanide, propylene, and ethylene, with smaller amounts of butane, propane, ethane, methane, and hydrogen. J. G.

299. Organic deuterium compounds. V. The chlorination of propyne and propyne-d_4. L. C. Leitch. *Canad. J. Chem.*, 1953, **31**, 385–6.—1 : 1 : 2 : 2-tetrachloropropane was formed in 60–65% yield, together with smaller amounts of *trans*-1 : 2-dichloro-1-propene in the chlorination of propyne. Nearly theoretical yields of *cis*- and *trans*-1 : 2-dichloro-1-propene were obtained by partial dechlorination of tetrachloropropane with zinc dust. J. G.

300. Kinetics of the thermal decomposition of vinyl *iso*-propyl ether. A. T. Blades. *Canad. J. Chem.*, 1953, **31**, 418–21.—The decomposition into propylene and acetaldehyde is shown to obey a first order rate law over the temp range 447°–521° C. J. G.

301. The reaction of active nitrogen with ethylene. J. Versteeg and C. A. Winkler. *Canad. J. Chem.*, 1953, **31**, 1–3.—The main product of the reaction is hydrogen cyanide, with smaller quantities of ethane, cyanogen, acetylene, and methane also formed. Variation in yield with flow rate of ethylene is established. J. G.

302. The reaction of active nitrogen with acetylene. J. Versteeg and C. A. Winkler. *Canad. J. Chem.*, 1953, **31**, 129–33.—The products of the reaction were hydrogen cyanide and a polymer, together with smaller quantities of cyanogen and methane. The results are discussed and a reaction mechanism proposed. J. G.

303. The diffusion of poly*iso*butylene in different solvents. C. Luner and C. A. Winkler. *Canad. J. Chem.*, 1953, **31**, 150–2.—The solvents used were benzene, carbon tetrachloride, and *n*-heptane. With the first 2 solvents the diffusion coeff decreased with increase in mol. wt., but with *n*-heptane the diffusion coeff first decreased, then increased with increase in mol. wt. J. G.

304. Understanding the chemistry of petrochemical reactions. Pt V. Chlorination of paraffin and aromatic hydrocarbons. L. F. Hatch. *Petrol. Refin.*, 1953, **32** (9), 207–9.—The basic

chlorination reactions are outlined and the total production and uses of the various products discussed. R. D. S.

305. Patent. U.S.P. 2,647,855 (10.10.51; 4.8.53). G. R. Grunewald and F. J. Pierce, assrs to Universal Oil Products Co. Apparatus and process for countercurrently contacting a light fluid with a relatively dense liq which is substantially immiscible with the light fluid in a vertically elongated column having vertically spaced perforated partitions dividing the column into a plurality of contacting zones. D. A. R.

ANALYSIS AND TESTING

306. Methods of hydrocarbon type analysis. H. C. Rampton. *J. Inst. Petrol.*, 1953, **39**, 305–27.—The limitations and scope of the preferred methods of hydrocarbon analysis are discussed. Compositions of naphtha and kerosine cuts from various crude sources and of typical cracked naphthas, as determined by these methods, are given. The influence of sulphur content on hydrocarbon type analysis in the gas oil boiling range has been investigated and assessments of gas oil composition made. A. R. W. B.

307. Refining properties of new crudes. C. M. McKinney and H. M. Smith. *Petrol. Process.*, 1953, **8** (8), 1164–7.—Analytical data are given for 10 new crude oils produced from the Spraberry area in Texas. The data are compared with other data collected from crudes found in the East Texas and Scurry County area.

Inspection information, including octane and cetane numbers on gasoline and diesel fuels, respectively, are given for 2 of the crude oils. J. W. H.

308. Improved methods—grease analysis. C. B. Coenen and R. S. Urner. *Inst. Spokesm. nat. Labric. Gr. Inst.*, Aug. 1953, **17** (5), 8–17.—Procedures described for isolating the main constituents of greases, are applicable to greases formulated with materials interfering with the use of standard methods of grease analysis. Greases containing alkali soaps are dispersed in hexane, and soln and partitioning of the constituents effected by adding a hot 50–50 mixture of water and *iso*propyl alcohol. Those containing soaps of alkaline earths and Al are completely dispersed in hexane and then treated repeatedly with a cold 50% acetic acid soln. Full details of procedures are also presented for the analysis of mixed petroleum base-oils and aliphatic diesters and other synthetic oils. Accuracy and precision obtained by these methods are claimed to be considerably better than those usually obtained by present standard methods. J. G. H.

309. Test for aircraft gear lubricants. E. A. Ryder. *ASTM Bull.*, Sept. 1952, **184**, 41–3.—The Pratt and Whitney Gear and Lubricant Tester, previously described (see Abs. **482** of 1948) is now commercially available, and current version is described in detail, together with the test procedure and evaluation of results. J. G. H.

310. Laboratory tests for pumpability of residual fuel oils. V. L. Shipp and L. D. Tredick. *ASTM Bull.*, Apr. 1953, **189**, 48–52.—The significance of pumpability in the use of fuel oils is noted, and earlier methods for its evaluation are briefly described. The current lab tests for predicating the pumpability of heavy waxy fuels, pour points, Socony Vacuum max pour point, flow test, setting point, pressure vis, and the P. and O. fluidity test are evaluated and, following experimental work, which is described, it is suggested that the P. and O. fluidity test, with modifications derived from the Socony Vacuum max pour point test, correlates most closely with full scale pumping conditions. The desirability of further work on similar lines is indicated. J. G. H.

311. Rotary bomb oxidation test for inhibited turbine oils. G. H. von Fuchs, E. L. Claridge, and H. H. Zuidema. *ASTM Bull.*, Dec. 1952, **186**, 43–6.—The need for an accelerated oxidn test for inhibited turbine oils is remarked, and details are presented of a rotary bomb test employing a modification of the Parr bomb as used in ASTM D 129–51. The apparatus and procedure used are described, safety precautions necessary are indicated, and the effect of temp and rate of rotation are discussed. Precision of the rotary bomb test appears on available data to be reasonably good; correlation with ASTM D 943 results has not yet been established on a satisfactory basis with oils of unknown composition. J. G. H.

312. The influence of some antioxidants on the artificial ageing of turbine oils. Z. Stepek. *Bull. Polish Inst. Petrol.*, 1952, **2**, 8–9.—Paper concerned itself with relationship between natural and artificial ageing of turbine oils. The influence of oxygen, water, metals, temp, pressure, light, as well as refining methods were discussed. Several methods of artificial ageing were considered, and it was found that results obtained by method of extraction gives best agreement with normal ageing properties when oil has been tested in a bomb at 150° C for 4–10 hr. Further, the influence of inhibitors on ageing has been tested by above method, and best results were obtained using parahydroxydiphenylamine. M. S.

313. Modified method for the estimation of corrosion due to the free sulphur and sulphur compounds in oils. R. A. Patton and J. H. Lublick. *ASTM Bull.*, Dec. 1952, **186**, 59–66.—The present unsatisfactory state of evaluation in the ASTM Copper Strip Test and in present modifications of the test are remarked, and data are presented on a method evolved utilizing instrumental observation with a Beckman DU spectrophotometer fitted with a diffuse reflectance attachment. The basic optics of films in plane surfaces and the effect of films on the colours reflected from copper strip surfaces are discussed. The methods of preparation of the copper strips, of exposure and of reflectance measurement are described; results and degree of correlation so far obtained provide justification for further investigation. J. G. H.

314. Analysis of synthetic detergents by infra-red absorption technique. P. Sadtler. *ASTM Bull.*, May 1953, **190**, 51–3.—The special advantages of infra-red absorption methods in the examination of synthetic detergents are set out and details given of the procedure for preparation of samples. Tabular data are presented giving the points of identification of the main functional groups, and spectra of selected surface active agents are illustrated and discussed. J. G. H.

315. Temperature effects in thixotropic systems. G. B. Moses, A. F. Sirianni, and I. E. Puddington. *Canad. J. Tech.*, 1953, **31**, 121–6.—The variation in coeff of thixotropy of some grease-like systems with change in temp and after high shear was examined. The greater effects occur with dispersions of sodium soaps in oil, and are greatly reduced with non-soap pastes. J. G.

316. How many operating variables can you control? M. G. Larian. *Petrol. Refin.*, 1953, **32** (9), 219–23.—A discussion of the applications of the concept of "degrees of freedom" as an instrument of mathematical analysis, with special reference to the initial analysis of design problems. R. D. S.

317. Correlating equilibrium flash vaporization data. Petroleum crudes and fractions. Pt I. E. H. Ten Eyck and D. F. Othmer. *Petrol. Refin.*, 1953, **32** (9), 229–32.—A correlation is presented for obtaining curves from a limited amount of experimental data which may be available at pressures other than the ones desired. A plot on log paper gives straight lines, the slopes of which may be used to determine the heats of vaporization of the hydrocarbon mixtures. R. D. S.

318. New charts for the determination of viscosity index. W. Setkowicz. *Nafta (Krakow)*, 1953, **9**, 71–9, 99–108.—Pt I gives the historical background and traces the development of this index from Dean and Davies formulæ in Saybolt

seconds and ° F. European need for a formular in ° C and cs has been first met by M. Otto by his graphical method, but increased range of visc of modern products has prompted the Polish I.P. to commission author to extend this work. In company with Dr Revenda of Czechoslovakia he compared unofficial Polish tables with those officially used in Czechoslovakia and also with IP 73/42 and ASTM B 567–41. Modified corrected formulæ covering the various ranges are :

2·0–3·8 cs/100° C	$\begin{cases} L : y = 1{\cdot}7256x + 0{\cdot}6111x^2 \\ H : y = 1{\cdot}48686x + 0{\cdot}5041x^2 \end{cases}$
3·9–5·2 cs/100° C	L : not given as formula
3·9–5·0 cs/100° C	$H : y = 1{\cdot}9782x + 0{\cdot}29627x^2$
5·2–6·2 cs/100° C	L : y is a linear function of x
5·0–6·1 cs/100° C	H : y is a linear function of x
6·3–7·0 cs/100° C	L : not given as formula
6·2–6·8 cs/100° C	$H : y = 1{\cdot}98755x + 0{\cdot}36824x^2$
7·1–12·0 cs/100° C	$L : y = 6{\cdot}5233x + 0{\cdot}28605x^2 - 15{\cdot}085$
6·8–12·1 cs/100° C	$H : y + 4{\cdot}5469x + 0{\cdot}122044x^2 - 6{\cdot}02$
12·0–33·5 cs100° C	$L : y = 6{\cdot}3286x + 0{\cdot}30303x^2 - 15{\cdot}14$
12·1–39·1 cs/100° C	$H : y = 5{\cdot}4195x + 0{\cdot}09156x^2 - 12{\cdot}04$
33·5–71·3 cs/100° C	$L : y = 11{\cdot}0664x + 0{\cdot}23227x^2 - 94{\cdot}66$
39·1–72·0 cs/100° C	$H : y = 7{\cdot}3414x + 0{\cdot}064417x^2 - 45{\cdot}75$

where x is kinematic visc at 100° C and y is η at 50° C in cs. Due to the fact that British and U.S. standards employ curves for H and L crossing at 210° F, *i.e.* 98·89° C and the new chart uses curves crossing at 100° C a table of corrections is necessary. This provides average corrections for the range of 5·0–70·0 cs. Further check on results obtained by these formulæ shows that V.I. calculated using above formulæ may differ by $\pm 0{\cdot}5$ from those given by ASTM. Total error from both sources varies between 1 and 2. Tables are appended, and a provisional standard method is given using Vogel–Ossaga viscometer or similar instrument. M. S.

319. Free radicals by mass spectrometry. III. Radicals in the thermal decomposition of some benzene derivatives. K. U. Ingold and F. P. Lossing. *Canad. J. Chem.*, 1953, **31**, 30–41.—Benzene, toluene, benzaldehyde, anisole, diphenyl, phenyl ether, and benzyl ether were pyrolysed in a free radical mass spectrometer and the products analysed. Phenyl and benzyl radicals were fairly stable below 1150°. Phenoxy and benzoyl radicals were less abundant and less stable.
J. G.

320. Patents. U.S.P. 2,637,198 (27.4.50; 5.5.53). M. G. Spangler and T. Y. Chu, assrs to Iowa State College Research Foundation. Apparatus for testing asphaltic concrete.

U.S.P. 2,638,778 (29.7.48; 19.5.53). E. P. Miller. Viscosimeter.

U.S.P. 2,639,609 (3.6.47; 26.5.53). F. L. Shands, assr to E. I. du Pont de Nemours and Co. Apparatus for determining the b.p. of crude products in a chemical process.
J. M. S.

U.S.P. 2,640,870 (2.12.49; 2.6.53). R. O. Seitz, assr to Air Reduction Co. Method of and apparatus for determining the presence of impurities in gases in which an electric arc of predetermined and constant length at a predetermined rate of flow of electric current is maintained in a stream of the gas maintained at constant pressure and the energy consumed in the arc is measured. V. P. P.

U.S.P. 2,648,010 (10.8.49; 4.8.53). C. D. Smith assrs to Standard Oil Development Co. A process for characterizing complex liq mixtures of hydrocarbons by infra-red absorption characteristics.

U.S.P. 2,648,598 (27.6.50; 11.8.53). F. Stitt, Y. Tomimatsu, and A. H. Tjensvold, assrs to U.S.A. (Secretary of Agriculture). The process of determining the concn of ethylene in a gas which comprises passing the gas at a temp from *ca* 285° to *ca* 300° C over red mercuric oxide for a contact time of 2–25 seconds, whereby a reaction occurs and mercury is released into the gas in proportion to the concn of ethylene.

U.S.P. 2,648,976 (12.4.46; 18.6.53). A. Bur. The method of taking gas samples from a duct or passage through which gases are passing, which includes moving the sample receiving portion of a sampling tube in different directions over a section of the area of the duct, and recording the analyses of the samples received by the tube in one manner as the tube moves in one direction, and in a different manner as the tube moves in another direction.

U.S.P. 2,649,165 (20.3.52; 18.8.53). A. Stabler, assr to Sinclair Research Laboratories. A grease compactor useful in preparing uniform samples of grease for penetration testing. D. A. R.

CRUDE OIL

321. Interfacial activities and porphyrin contents of petroleum extracts. H. N. Dunning, J. W. Moore, and M. O. Denekas. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1759–65.—A California crude oil was fractionated by solvent extraction and chromatographic procedures. The interfacial activities, film-forming tendencies, concentration of metal-porphyrin complexes, and free porphyrin concentrations of the extracts were determined. The particular crude was shown to have both nickel- and vanadium-porphyrin complexes present, the stability of the former being such as to account for the difficulty in removing these metals from crude petroleum.
E. J. C.

GAS

322. The production of liquefied fuel gases. E. S. Squire. *J. Inst. Petrol.*, 1953, **39**, 243–7.—In Britain liquefied petroleum gases (LPG) are obtained from crude oil, or cracking, reforming, or hydrogenation processes. For domestic purposes LPG consists essentially of C_4 hydrocarbons. For industrial uses such as metal cutting, C_3 hydrocarbons are normally used. LPG has to be free from H_2S, but possess sufficient odour to enable leaks to be detected.
A. R. W. B.

323. Distribution of liquefied petroleum gases. S. Shaw. *J. Inst. Petrol.*, 1953, **39**, 247–50.—The brief history of the present distribution system of LPG cyl by road transport is given. At present approx 2,800,000 32-lb cyl are distributed annually in Great Britain. A. R. W. B.

324. Utilization of liquefied petroleum gases. T. H. Taylor. *J. Inst. Petrol.*, 1953, **39**, 250–6.—The diverse applications of LPG as a fuel are discussed, and the design details of storage cyl and their installation described. A. R. W. B.

325. Patents. U.S.P. 2,626,860 (21.7.49; 27.1.53). C. J. Dorf, assr to Union Carbide and Carbon Corpn. A backfire in compressed fuel gas is extinguished by placing a porous mass A in the fuel gas stream B and maintaining a supply of cooling liq adjacent to A but out of B so that in prompt response to a backfire on the downstream side of A, B is brought into contact with A. A is suitably stainless steel wool. B is preferably water or an aq soln.

U.S.P. 2,625,238 (12.7.47; 13.1.53). J. H. Roper, assr to Koppers Co. Dust-laden gas is flowed through a pptn zone in which is disposed a planar collecting electrode A, on both sides of which the dust is pptd. The dust laden parts of A are withdrawn, the dust dislodged, and the parts returned, the operation being effected so that the electrode surfaces are substantially continuous throughout the zone. Redispersion of dust in the gas during dislodgment from the electrode is thereby prevented. V. P. P.

ENGINE FUELS

326. Spontaneous ignition properties of fuels and hydrocarbons. J. E. Johnson, J. W. Crellin, and N. W. Carhart. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1749–53.—Apparatus, procedure, and results reported for diesel fuels and some pure hydrocarbons. E. J. C.

327. Tetraethyl radio-lead studies of combustion chamber deposit formation. H. P. Landerl and B. M. Sturgis. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1744–8.—Using radioactive tetraethyl-lead it was possible to study changes occurring in combustion chamber deposits over short periods. A new type of deposit migration, defined as "flecking," occurred as a result of the breaking off of small particles of the deposit. Flecking is responsible for a previously unrecognized form of scavenging, and largely accounts for deposits on exhaust valves. E. J. C.

328. High temperature combustion chamber. A. Weir, Jr. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1637–44.—Flame holders in ram-jets do not prevent blowout at high mass velocities. Efficient combustion at high mass velocities has been obtained without the use of drag-producing flame holders in a ceramic-lined tube. Spectroscopic study was initiated to gain insight into mechanisms underlying successful performance of this design.

Combustion efficiencies of over 90% were obtained at a mass velocity of 50 lb/sec/sq. ft. with ceramic chamber walls at 3000° F. E. J. C.

329. Combustion performance with instantaneous mixing. W. H. Avery and R. W. Hart. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1634–7.—Combustion under ram-jet operating conditions was studied in a theoretical combustor where fuel–air mixture was injected stagewise and mixed instantaneously with material in the combustor, but burning rates and heat release were governed by ordinary chemical kinetics. Indicated that combustor behaviour depended on pressure, injected mixture temp, reactor temp, and heating rate and temp of combustor pilot. E. J. C.

330. Flame stability in bluff body recirculation zones. J. P. Longwell, E. E. Frost, and M. A. Weiss. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1629–33.—Theoretical considerations are presented on the stability of flames of the type encountered in jet engines on the assumption that combustion is a second order reaction. E. J. C.

331. Note on the influence of naphthalene on octane ratings. G. E. Mapstone and J. S. Durham. *J. Inst. Petrol.*, 1953, **39**, 276–7.—The octane ratings of some naphthalene blends are reported. A. R. W. B.

332. Patents. U.S.P. 2,625,108 (14.3.51; 13.1.53). J. A. Logan, assr to Gilbert and Barker Manufacturing Co. Gasoline dispensing pump in which means are provided to enable the pump to start up in unloaded condition whereby the motor which drives the pump can have less driving torque than would otherwise be necessary. V. P. P.

U.S.P. 2,637,161 (10.11.49; 5.5.53). J. G. Tschinkel, assr to U.S.A. (Secretary of the Army). Combustion is initiated in a rocket motor by bringing together nitric acid, nitrogen tetroxide or hydrogen peroxide and aniline, furfuryl alcohol, pyrocatechol or hydrazine hydrate, and the combustion is continued by bringing together the oxidizer and gasoline or benzene.

U.S.P. 2,637,635 (9.6.49; 5.5.53). E. J. McLaughlin, G. H. Denison, and W. R. Barusch, assrs to California Research Corpn. Supplementary spark-ignition engine fuel comprising a water–alcohol mixture and a dissolved phenylenediamine.

U.S.P. 2,637,636 (10.4.44; 5.5.53). E. L. Walters, assr to Shell Development Co. Aviation gasoline containing an aromatic amine, T.E.L., and 8-hydroxyquinoline. J. M. S.

GAS OIL AND FUEL OIL

333. The metallic elements in residual fuel oils. F. H. Garner, S. J. Green, F. D. Harper, and R. E. Pegg. *J. Inst. Petrol.*, 1953, **39**, 278–93.—Iron, sodium, vanadium, and nickel were the chief metals found in an Iraq residue, and methods have been developed for determining these elements in oils. It was found that the vanadium and nickel compounds could not be removed by simple means. They could be concentrated in the precipitated asphalt portion of the residual oil. Adsorbent and solvent extraction methods of concentrating vanadium compounds were only partially successful. A. R. W. B.

334. Stability of fuel oil–gas oil blends. D. G. Butlin. *J. Inst. Petrol.*, 1953, **39**, 294–303.—Improved methods of predicting the compatibility of asphaltic fuel oil and gas oil blends are suggested, whereby an allowance is made for the surface tension of the gas oil. The determination of xylene equivalent has been improved by using *iso*-octane or *n*-heptane instead of white spirit. A. R. W. B.

335. Patents. U.S.P. 2,625,213 (14.3.47; 13.1.53). W. J. Smith and W. W. Slaght, assrs to Cleveland Steel Products Corpn. Fuel burner of wall flame type capable of delivering fuel without fluctuations throughout a wide range of fuel delivery, of delivering fuel uniformly in starting and having improved means for regulating the air supply, especially with slow rates of fuel delivery.

U.S.P. 2,625,214 (22.5.48; 13.1.53). R. N. St. John and K. E. Goldsberry, assrs to Coleman Co. Pot type burner with specially arranged ports in the lower part to produce a better oil vapour–air mixture.

U.S.P. 2,625,216 (30.12.48; 13.1.53). C. K. Strobel, assr to Robertshaw–Fulton Controls Co. Control and ignition system for fuel burners.

U.S.P. 2,624,398 (22.8.47; 6.1.53). E. C. Thomson, assr to Combustion Control Corpn. Photocell controlled safety system for fuel burners.

U.S.P. 2,626,657 (27.6.49; 27.1.53). J. M. Wilson, assr to Minneapolis–Honeywell Regulator Co. Burner control apparatus employing an electron discharge device *A*, which is rendered operative upon the need for operation of a burner and an electronic flame detector which will render *A* inoperative when there is a flame failure and maintain *A* inoperative when there is a false indication of flame.

U.S.P. 2,641,538–9 ((*a*) 6.4.50, (*b*) 12.4.50; 9.6.53). R. B. Thompson and J. A. Chenicek, assrs to Universal Oil Products Co. Discoloration of fuel oils is inhibited by adding (*a*) a benzalaminoalkanol *A* or a furfuralaminoalkanol, the alkanol group containing 2–12 carbon atoms; (*b*) 0·0005–1·0 wt % of a mixture comprising 10–50 wt % *A*, 10–70 wt % C_{8-40} alkanolamine, 10–70 wt % C_{6-20} alkylamine, and 1–20 wt % of a metal deactivator comprising a compound capable of forming chelate compounds with metals. V. P. P.

U.S.P. 2,648,499 (25.1.51; 11.8.53). P. M. Dana, assr to Standard Oil Development Co. Apparatus for controlling the relative ratio of fuel-oil and fuel-gas to a burner in order to maintain a predetermined B.T.U. input. D. A. R.

LUBRICANTS

336. Handling, storing, and dispensing lubricants. 1. Initial handling. Anon. *Sci. Lubric.*, July 1953, **5** (7), 12–16, 36; Aug. 1953, **5** (8), 16, 23.—Covers mechanical skids, fork lift trucks, and special drum-carrying devices.

Requirements for a satisfactory oil store (user's premises) are enumerated, and the advantages of indoor storage are discussed. Equipment for the movement and stacking of barrels and drums is described, together with dispensing, filtering, and metering appliances. J. G. H.

337. New performance test for cutting fluids. J. M. Stokely. *Lubric. Engng*, June 1953, **9** (3), 137–9.—The development of laboratory performance tests for metal cutting fluids is described, and details are presented of a new laboratory performance test using a precision sharpened drill which produces a series of holes of constant depth in a test block at constant feed with drilling speed increased by a known amount for each hole. The test correlates well with field performance

and permits rapid evaluation of the effect of additives at various concn and direct comparisons of finished cutting fluids. Further charts show comparisons of sol oil emulsions at various dilutions and sol oil emulsion *vs* compounded cutting oils. J. G. H.

338. Emulsions and straight cutting fluids. A. E. Lawson and E. G. Ellis. *Sci. Lubric.*, June 1953, **5** (6), 22–4.—The main differences in function between cutting oils and bearing lubricants are noted, and the manner in which emulsions and straight oils fulfil the main requirements of cutting oils are indicated, together with their active lubricating components, and the influence of density and visc on tool lubrication. Emulsion instability is also discussed. J. G. H.

339. Aliphatic esters—properties and lubricant applications. G. Cohen, C. M. Murphy, J. G. O'Rear, H. Ravner, and W. A. Zisman. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1766–75.—Useful synthetic lubricants were developed from various materials such as caproic, pelargonic, glutaric, methyl adipic, pimelic, and tricarballylic acids, various diols, dipropylene glycol, and 4 triols besides glycerol. A large number of compounds were studied as anti-oxidants in ester liq up to 175° C. All classes of anti-oxidants were ineffective above certain temp. Phenyl-1-naphthylamine, dialkyl selenides, phenothiazines, and α- and β-conidendrins were the most effective above 150° C. E. J. C.

340. Spontaneous ignition of lubricating oils. C. E. Frank, A. U. Blackham, and D. E. Swarts. *Industr. Engng Chem.* (*Industr.*), 1953, **45**, 1753–9.—Describes the investigation of various types of lubricants and potential lubricants with respect to S.I.T., and gives observations regarding the effects of structure, additives, and metal surfaces on S.I.T.

Problem has bearing on initiation of fires in aircraft. E. J. C.

341. Lubrication of ball and roller bearings. 5. Sealing. Anon. *Sci. Lubric.*, Aug. 1953, **5** (8), 10–15.—The function of lubricant seals is briefly described, and the various types of seal enumerated and illustrated. Other points discussed include capillary flow, oil slingers, bearings on vertical shafts, and the effects of the presence of moisture. J. G. H.

342. Recent views on properties of bearing metals. B. Lunn. *Sci. Lubric.*, Apr. 1953, **5** (4), 26, 28.—Details are presented of a simple method for the evaluation of bearing properties of metals and the lubricating properties of lubricants based on conditions of controlled boundary lubrication. The test rig consists of a piece of the bearing metal furnished with a ball bearing fixed in a chuck as a sliding element. The ball is pressed down on to the test piece with constant load and given reciprocating movement of 72 r.p.m., providing in this manner 144 starts/minute. The test piece and ball are immersed in lub oil, and the max speed of the ball is about 0·5 m/sec with a stroke of 127 mm. J. G. H.

343. Roller bearing grease lubricants for railway car journals. H. T. Rockwell. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, June 1953, **17** (3), 8–16.—The development of high speed diesel-powered locomotives has resulted in a demand for a single grade grease suitable for all makes of roller bearings, and difficulties encountered due to deficiencies in bearing design are outlined. The A.A.R. rules for lubrication are discussed, lubricant application methods described, and desired properties of lubricants set out. Operating experience with lime soap and soda lime grease is reported in the discussion. J. G. H.

344. Relation between bearing clearances and bearing life with silicone grease at 150° C. G. Grant. *Lubr. Engng*, Apr. 1953, **9** (2), 73–4, 97–8.—In the high temp life testing of various greases a wide dispersion in the life of ball bearings lubricated with silicone oil–lithium soap grease was obtained, while bearings lubricated with organic oil-metallic soap greases showed a relatively short but more uniform life under test conditions which seemed to be identical. Test factors were indicated thus, which, while irrelevant in the life of conventional greases of 150° C, were sufficiently potent to reduce the life of silicone grease lubricated bearings to a time comparable to that of the organic oil-metallic soap greases, or to permit a life expectancy of 15–20 times that of the shorter runs. Further investigation indicated that the tightness of the shaft fit and the amount of end play both exerted a significant effect on bearing life. Critical values for these factors are given, and assembly and operating recommendations for bearings which call for lubrication with silicone grease are put forward. J. G. H.

345. Cavitation in journal bearings. H. L. McBroom. *Sci. Lubric*, Apr. 1953, **5** (4), 10–16.—While the existence of cavitation in the divergent part of a lub oil film has long been presumed, its occurrence has only been inadequately demonstrated and its consequences little appreciated. Details are presented of an investigation which provides on a small scale a definite indication of certain primary effects of cavitation in a lubricated bearing. The apparatus employed comprises a rotating shaft supported in bearings with a small running clearance, while the test bearing operates on the shaft with relatively large clearance. Means for displacing the bearing relative to the shaft in the horizontal and vertical directions is provided by 2 simple levers. Methods of operation are described, and values of bearing load and displacement and pressure distribution under varying conditions of load and shaft are graphically illustrated. The effect of pressure feed, the influence of air in soln, of static, and of no loading are discussed; possible damage to bearing surfaces is considered only as a secondary effect, and is not discussed. J. G. H.

346. Minimum oil requirements of ball bearings. E. R. Booser and D. F. Wilcock. *Lubric. Engng*, June 1953, **9** (3), 140–3, 156–8.—Results are reported of a study of the running time of ball bearings operating with minute quantities of lub oil. The equipment used and method of operation employed are described, and the results obtained graphically illustrated. For specific conditions the running life of ball bearings is shown to be an exponential function of the quantity of lub oil present; these indicate that medium-size ball bearings can run for years on one drop of oil at moderate loads and speeds. Data are presented for various bearings, speeds, loads, and types of lubricants. Some correlation is obtained with the life of greased ball bearings, and possible applications to ball bearing construction, operation, and mist lubrication are indicated. J. G. H.

347. Effects of modern design trends on ball bearing research. L. D. Cobb. *Lubric. Engng*, Apr. 1953, **9** (2), 78–80, 102.—The demands made on bearing design by present trends towards high temp, high speed, and heavy loading calls for extended investigation into new materials, methods of test, and the study of operating conditions. Details are presented on investigations into the effect of Rockwell hardness of 52100 steel on bearing endurance, the dimensional stabilization of bearings of 52100 steel, high temp, steels for ball bearing components, lubrication, and ball bearing separators. The need for improved test rigs is also stressed. J. G. H.

348. Synthetic fluids for lubricants and hydraulic purposes. W. H. Millett. *Sci. Lubric.*, Oct. 1953, **5** (10), 24–5.—The use of polyglycol derivatives (" Ucon " fluids), silicones, esters, and halogenated compounds for lubrication and hydraulic purposes is briefly reviewed. J. G. H.

349. Mathematical symbols for lubrication problems. J. Boyd. *Lubric. Engng*, Aug. 1953, **9** (4), 209–10.—A revision with comments on individual symbols of the proposed list of symbols put forward by the A.S.L.E. in 1951. J. G. H.

350. British American starts manufacturing its own grease at Clarkson. R. O. Rinearson and C. W. Nofsinger. *Nat. Spokesm. nat. Lubric. Gr. Inst.*, Sept. 1953, **17** (6), 8–15.—An illustrated description with flow sheet of a new plant

designed to produce calcium, sodium, lithium, and barium greases, as well as those of the mixed-base and non-soap types. Special features described include storage facilities, conveyor equipment, and pilot plant. J. H. G.

351. Laboratory evaluation of lubricating greases. 3, 4. E. G. Ellis. *Sci. Lubric.*, May 1953, **5** (5), 18–23; July 1953, **5** (7), 17–19, 22–3.—The development and elaboration of grease specifications is outlined, and the use of rig tests remarked. The need for equipment for the study of grease behaviour has resulted in the development of the torque rheometer, which is described, together with its method of use and the interpretation of results so obtained; its application to the study of thermal effects and of thixotropy and dilatancy is also discussed.

Melting point tests, oil syneresis, heat tests, storage stability, water adsorption, and oxidn are discussed. J. G. H.

352. Continuous method for the manufacture of lithium grease. P. J. Baker and N. T. Joyner. *Inst. Spokesm. nat Lubric. Gr. Inst.*, June 1953, **17** (3), 18–24.—The extended use of lithium greases has tended towards continuous processes in place of the present batch method, which is briefly described. The continuous process is dealt with in detail, including slurry preparation, heating, blending, chilling, milling, and packaging. Operating details are presented of a typical pilot plant run, and the advantages of the continuous process are enumerated. A semi-continuous method using soap prepared in the conventional manner is also described. J. G. H.

353. Lubricating greases. J. L. Finkelmann. *Lubric. Engng*, June 1953, **9** (3), 127–32.—The selection of oils and thickeners for grease manufacture are discussed, and the characteristics of greases formulated with metallic soaps are indicated. Additives used in grease manufacture are described from the functional standpoint, and the chemistry and manufacture of soap base greases is discussed in some detail, together with the special features of residuum greases and dispersed greases. Finishing processes are briefly considered and recent trends in the development of a multi-purpose grease are reported, together with the desirable characteristics for this type. J. G. H.

354. The structure of lubricating greases and its control. J. B. Matthews. *J. Inst. Petrol.*, 1953, **39**, 265–75.—Recent investigations of the structure of lub greases are reviewed. Greases are 2-phase systems, the soap phase existing in the form of very small fibres which form aggregates. The properties of the grease depend on the aggregation of the fibres and their length : dia ratios. The manner in which the properties of the grease can be controlled during manufacture is discussed. A. R. W. B.

355. Symposium on utilization of fatty acids in the manufacture of lubricating greases. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, March 1953, **16** (12), 16–32.—Summaries of papers presented at the N.L.G.I. Technical Committee Meetings, 29 Oct. 1952. Subjects covered include sources, manufacture, and composition of fatty acids, analytical methods in the fatty acid industry, effect on calcium greases of variations in fatty acids, effect of fatty acid variations on the properties of soda–soap greases, effect of constituent fatty acids on the properties of aluminium greases, and lithium base lub greases. J. G. H.

356. Development of significant bench tests for aircraft turbine lubricants. E. A. Ryder. *Lubric. Engng*, Aug. 1953, **9** (4), 201–3, 220–3.—The development of lubricants to withstand the severe conditions imposed in the operation of aircraft turbine engines has rendered necessary the devising of new tests to evaluate turbine lubricants. The coking test and the Ryder gear and lubricant test rig are described in some detail, and the possibilities of formulating a performance No. for turbine lubricants indicating their low and high temp effectiveness is discussed. In the discussion additional data on the coking test and on the Ryder rig were contributed. J. G. H.

357. Dilution as an aid to low temperature starting of aircraft engines. K. C. Hunt. *Sci. Lubric.*, May 1953, **5** (5), 14–17.—The basic requirements for aviation fuels and lubricants for cold starting down to −20° C are noted, and the development and operation of the Worth oil dilution system is described in some detail, together with some of the operating difficulties encountered. The possibilities of low visc lubricants are discussed, and it is concluded that the solution to cold starting problems must remain either with oil dilution or the application of external heat. J. G. H.

358. Evaluation of drawing lubricants. W. J. Wojtowicz. *Lubric. Engng*, Feb. 1953, **9** (1), 19–21, 41.—A method of evaluating drawing lubricants is presented which involves measuring the power required to draw a metal strip through a pair of loaded flat dies. Oil and emulsion type drawing compounds are discussed and their characteristic features indicated. The effects of diluents used are considered, together with preliminary chemical treatment of metal surfaces prior to drawing. J. G. H.

359. Turbine oils and turbine lubricating oil systems. 1. Turbine lubricating oil properties and typical circulation. G. H. Clark. *Sci. Lubric.*, Oct. 1953, **5** (10), 12–19.—The properties and requirements of turbine lub oils are discussed, and the development and functions of oxidn inhibitors are considered. Primary and secondary corrosion in turbine oil systems are described, and methods for their reduction outlined. The components of such systems are enumerated and their functions indicated, together with details of lubrication procedures for plain bearings thrust bearings, and flexible couplings. J. G. H.

360. Overseas experiences with the lubrication of high speed steam engines. R. W. Tong. *Sci. Lubric.*, Sept. 1953, **5** (9), 13–17.—Points covered include the selection and maintenance of oil filters and pumps, oil distribution systems, governors and flywheel end seals, steam temp and pressure, cylinder lubricators, and fitting drainpipes. J. G. H.

361. Solid lubricants. W. E. Campbell. *Lubric. Engng*, Aug. 1953, **9** (4), 195–200.—Recent developments resulting in the evolution of solid lubricants are remarked, and the mechanism of solid friction is considered, together with the desired properties of solid lubricants. These are grouped into 6 classes: layer-lattice or laminar solids, solid organic compounds—soaps, waxes and fats, chemical conversion coatings, soft metals, polymer films, and miscellaneous soft solids. Examples of application of each class are given and special characteristics indicated, and a classification of applications according to type is included. 31 refs. J. G. H.

362. Measurement of motor oil viscosity at 0° F. R. W. Foreman. *ASTM Bull.*, July 1953, **191**, 50–3.—The increased significance of the 0° F visc of motor oils under the new SAE crankcase oil classification is noted, and anomalous visc–temp behaviour at temp, near or below the cloud point frequently encountered with capillary viscometers is remarked. Details are presented of an investigation using rotational and capillary viscometers which indicated that repeatable results can be obtained rapidly and simply by the use of a rotational viscometer. J. G. H.

363. Varied role of glycerine in modern lubrication. M. A. Lesser. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, March 1953, **16** (12), 8–13.—The properties of glycerine which make it a valuable component of modern lubricant formulations are indicated, and its special applicability to low temp and worm and hypoid gear lubrication is discussed. The functions of glycerine in greases are considered, and its potentialities as an antifoaming agent for lubricants are remarked. J. G. H.

364. Oils for textile treatments. A. G. Arend. *Sci. Lubric.*, Sept. 1953, **5** (9), 24, 36–7.—The function and application of lubricants in the processing of textile fibres are indicated

with special reference to plasticizing, soaking, water-repelling, and dyeing. J. G. H.

365. Seals and closures. E. W. Fisher. *Lubric. Engng*, Aug. 1953, **9** (4), 190–4.—The development of the various types of seals and closures used to retain lubricants in bearings is briefly surveyed, and their characteristics, limitations, and methods of operation indicated. The properties of materials, generally used are discussed, and their effect on design is co nsidered. Combination seals, heat resistance, and rotary seals are also touched upon. J. G. H.

366. Safety alarm devices for lubrication systems. Anon. *Sci. Lubric.*, June 1953, **5** (6), 25–8.—The necessity for adequate safety alarm devices on pressure fed lub oil systems is stressed, and the series of safety devices, including pressure alarms, flow indicators, and thermostats, manufactured by the Monitor organization are described and illustrated. J. G. H.

367. Frictional behaviour of polyethylene, polytetrafluoroethylene, and halogenated derivatives. R. C. Bowers, W. C. Clinton, and W. A. Zisman. *Lubric. Engng*, Aug. 1953, **9**, 204–8, 218-19.—Details are presented of an investigation into the behaviour of polyethylene, polytetrafluoroethylene, and polytrifluoroethylene and their copolymers as solid lubricants. Thin films attached to steel plates were tested in a Bowden-Leben friction and wear machine, the results being discussed in 2 sections; those plastics which did not "stick–slip," and the rest. Of the former, polytetrafluoroethylene proved to have attractive lubricating properties, was further investigated, and its frictional properties on metals are discussed in detail. Its advantages and limitations as a lubricant and corrosion preventive are set out and possible applications indicated. J. G. H.

368. Influence of solid surface films on the friction and surface damage of steel at high sliding velocities. E. E. Bisson. *Lubric. Engng*, Apr. 1953, **9** (2), 75–7, 100–1.—Earlier interest in the possibilities of solid surface films as protective agents against friction and surface damage, as particularly encountered at the high speeds prevalent with jet and turboprop engines, is briefly surveyed, and data presented on N.A.C.A. research on the subject, with particular reference to iron oxides formed by oxidn of the metallic surface and the addition of MoS_2 as a dry lubricant. Experimental results indicate that the combination of the 2 at least prevents surface welding and maintains a dry friction coeff at a relatively low value. J. G. H.

369. Renovation of used oils with carbon and activated alumina. A. E. Williams. *Sci. Lubric.*, Sept. 1953, **5** (9), 19–23.—Methods of reconditioning lub oils are briefly surveyed, and those involving the use of carbon and activated alumina are considered in some detail. J. G. H.

370. Patents. U.S.P. 2,626,899 (26.6.50; 27.1.53). S. T. Abrams and F. H. Stross, assrs to Shell Development Co. Grease composition comprising a lub oil gelled with a cation exchange inorganic colloid bearing <30 wt % of hydrophobic cationic surface-active radicals, <50 wt % of the radicals being in salt formation with an acid of silicon, phosphorus, or sulphur.

U.S.P. 2,626,241 (24.12.49; 20.1.53). W. J. Sparks, A. J. Morway, and D. W. Young, assrs to Standard Oil Development Co. Grease consisting of a synthetic lub oil *A* thickened to grease consistency with a complex formed by reacting bentonite with an aliphatic amine salt, *A* being the residue left after dist at *ca* 250° C of the mixture obtained by reacting a C_7 mono-olefin with CO and H_2 in the OXO process.

U.S.P. 2,626,896 (3.11.50; 27.1.53). J. P. Dilworth, G. W. Eckert, and W. J. Coppoc, assrs to Texas Co. Lub grease comprising mainly a dehydrated mixture of 15–25% alkali metal soaps of a soap-forming material having an iodine No. of <40, 60–80% mineral oil, and 1–3% alkali metal hydroxide, the mixture having been digested at 300°–390° F/50–120 p.s.i. air pressure for <5 hr. In U.S.P. 2,626,898, the alkali metal greases are prepared by saponifying a mixture of a mineral lub oil, aq alkali metal hydroxide (excess), and a soap forming acid and/or ester, dehydrating the mixture and then digesting the mass at 300°–390° F/50–120 p.s.i. air pressure for <5 hr.

U.S.P. 2,626,897 (28.3.51; 27.1.53). W. A. Young and J. C. Zaborski, assrs to Sun Chemical Corpn. Lub grease comprising mineral oil and 2–20 wt %, based on grease, of an aluminium soap of a plurality of soap-forming acids, consisting of 98–75 wt % of a $C_{<16}$ saturated fatty acid, 2–25 wt % of dimerized linoleic acid, and a C_{4-16} saturated carboxylic acid, each of the latter two acids forming 1-15 wt % of the total acids. V. P. P.

U.S.P. 2,647,858 (23.8.50; 4.8.53). P. B. Weisz, assr to Socony-Vacuum Oil Co. A method for removing colour bodies from petroleum lub oil.

U.S.P. 2,647,872 (27.1.50; 4.8.53). W. H. Peterson, assr to Shell Development Co. A grease composition comprising a lub oil, 1–20% by wt of an originally hydrophilic inorganic gelling agent capable of forming a grease structure in the oil, 0·5–10% by wt of a hydroxy-containing hydrophobic surface-active compound (*e.g.* hydroxy fatty acids), and 0·5–10% by wt of an alkyl or alkenyl aliphatic dicarboxylic acid or an anhydride, half-amide, or aliphatic ester of the acids.

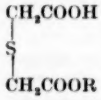
U.S.P. 2,647,873 (G.B. 7.7.48; 4.8.53). J. B. Matthews and T. B. Grimshaw, assrs to Shell Development Co. A process for preparing an improved oil additive comprising condensing an alkyl phenol with an aliphatic aldehyde, and simultaneously neutralizing the condensation product with an alkaline earth metal basic compound, and thereafter heat-treating the neutralized condensation product at a temp of from 120° to 170° C for a period of time between $\frac{1}{2}$ and 50 hr.

U.S.P. 2,648,617 (2.9.48; 11.8.53). N. D. Hanson, assr to Union Carbide and Carbon Corpn. Filter medium capable of filtering sludge from lub oil, and characterized by flexibility and resistance to the action of water comprising a porous fibrous structure impregnated with a polyhydric alcohol ester of an aliphatic diene-monoacid, the ester being in an insoluble condition and in amount retaining the porosity of the structure for a filtering action.

U.S.P. 2,648,633 (19.12.50; 11.8.53). W. H. Peterson and T. Skei, assrs to Shell Development Co. A lubricating composition comprising a major amount of a lub oil, a minor amount, sufficient to at least thicken the oil, of an inorganic colloid having an average particle size less than *ca* 100 millimicrons, 10–75% wt based on the colloid, of a cationic hydrophobic surface active agent, and 1–20% by wt based on the colloid of an inorganic nitrite.

U.S.P. 2,648,634 (14.7.50; 11.8.53). R. J. Moore, assr to Shell Development Co. A method of preparing a grease composition which comprises successive heating, cooling, and subjecting to shearing of the liq lubricant–soap mixture.

U.S.P. 2,649,416 (3.3.49; 18.8.53). F. P. Richter and E. W. Fuller, assrs to Socony-Vacuum Oil Co. A lub oil containing a small amount sufficient to prevent rusting of ferrous metal surfaces, of a monoester of a thiodiacetic acid having the formula



wherein R is an aliphatic hydrocarbon radical which has a C_{16}–C_{18} normal chain length.

U.S.P. 2,650,188 (1.11.49; 25.8.53). G. E. Reese and J. L. Larkin, assrs to Sun Oil Co. In a process for preparing lub oil from naphthenic base crude petroleum wherein

hydrocarbons boiling below the lub oil range are removed as dist in a primary dist step and lub oil is removed as dist in a subsequent vacuum dist step, the steps for producing lub oil having improved bloom and colour stability characteristics which consist of reacting the charge to one of the dist steps with ammonia in the presence of caustic soda. The ammonia and caustic soda having been added in amounts of at least 1·2 lb NaOH and 0·1 lb NH_3, respectively, per brl of mazout resulting from the first dist step. D. A. R.

BITUMEN, ASPHALT, AND TAR

371. Fine cold asphalt. H. E. Carter. *Rds & Rd Constr.*, Apr. 1953, **31** (264), 99–105.—Cold asphalt is defined and the raw materials used, composition of mix, methods of manufacture, storage and transportation, and laying practice are discussed. Uses of cold asphalt are considered, together with the use of colours. Current specifications are noted and criticized. J. G. H.

372. Patents. U.S.P. 2,640,786 (8.7.48; 2.6.53). J. R. Parsons, M. C. Higgs, and M. A. Loos, assrs to United States Gypsum Co. A building element having water and fire resistant properties comprising a combustible base sheet coated with a binder containing 30–70 wt % asphalt, 10–25 wt % mineral wool masses of dia 3–20 mesh, and remainder ground minerals and/or asbestos.

U.S.P. 2,640,803 (30.7.51; 2.6.53). J. C. Illman and H. J. Sommer, assrs to Shell Development Co. Asphalt is blown in presence of a minor amount of a fluorinated phosphoric acid with an oxygen-containing gas at 400°–550° F.

U.S.P. 2,641,551 (20.7.49; 9.6.53). H. G. Smith, T. L. Cantrell, and E. E. Fisher, assrs to Gulf Oil Corpn. A liq coating composition for metals comprising 15–30% blown asphalt, 5–10% microcryst wax, up to 25% filler, up to 10% of a low mol. wt. resinous material (hydrogenated rosin, rosin, or coumarone indene resin), 0·01–2% of a primary fatty amine salt of 3-methylbutyl, 2-ethylhexyl orthophosphoric acid, and a solvent. V. P. P.

U.S.P. 2,649,384 (15.5.50; 18.8.53). A. P. Anderson, assr to Shell Development Co. An asphalt blowing flux consisting essentially of an asphaltic residue having a ring and ball soft. pt. between 70° and 120° F, and 5–20% by wt of the flux of a "soft wax" fraction, the fraction comprising 13–40% by wt of bright stock lub oil having a visc of at least 100 sec Saybolt Universal at 210° F obtainable from a waxy petroleum short residue and 60–87% by wt of microcrystalline wax, the wax being comprised predominantly of microcrystalline wax-type hydrocarbons individually melting between −18° and 40° C. D. A. R.

SPECIAL HYDROCARBON PRODUCTS

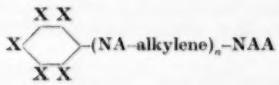
373. Heat treatment oils. A. L. H. Perry. *Sci. Lubric.*, June 1953, **5** (6), 13–19, 36–7.—The function of quenching oils is outlined, and characteristic quenching curves are described. The disadvantages of water quenching are indicated, and the properties determining the quenching power of oils are enumerated. The oils for quenching are discussed with characteristic properties, and standard quenching equipment is described and illustrated. The behaviour of quenching oils in service is considered, and methods of evaluating quenching power are touched on. Martempering and tempering oils are also briefly treated. J. G. H.

374. Serviceability of transformer oil. F. M. Clark. *ASTM Bull.*, Jan. 1953, **187**, 55–6.—The development of transformer oils, with special reference to the reduction of sludging tendencies, is briefly discussed, and the modification of transformer design to this end is indicated. Examinations by electrical companies of transformers in the field are described, and the measures taken to attain complete elimination of oil oxidn are noted. J. G. H.

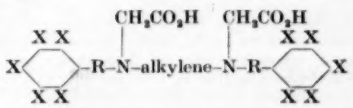
375. Patents. U.S.P. 2,624,729 (1.12.50; 6.1.53). S. Melamod and W. J. Croxall, assrs to Rohm amd Haas Co. As new chemical substances, compounds of the formula

wherein A is an alkylene chain of 2 or 3 carbon atoms, X = $-S_x-$, $-SO-$, or $-SO_2-$, where $x = 1$ or 2, the alkyl groups containing >18 C atoms. The compounds have pesticidal (acaricidal) properties, *e.g.* 2 : 6-di(2-ethylhexyl)perhydro-1 : 2 : 6-thiadiazine, the corresponding thiadiazine-1-oxide, 2 : 5-di(3 : 5 : 5-trimethylhexyl)-1 : 2 : 5-thiazolidine, and NN-di(3 : 5 : 5-trimethylhexyl)-perhydrodithiadiazine.

U.S.P. 2,624,756–60 (1.11.50; 6.1.53). F. C. Berswerth. (*a*) Compounds of the formula



wherein alkylene is $(CH_2)_2.(CH_2)_3$ or $CH(CH_3).CH_2$; n is 1–5; A is CH_2COOH or $CH_2.CH_2.COOH$; X = H, OH, halogen, alkyl, or alkoxyl, 1–3 X's being halogen. The alkali, ammonium, and amine salts are water soluble, and form chelates with most divalent metals, especially alkaline earth metals and magnesium. (*b*) Compounds of formula



wherein R = C_{1-5} alkylene group; alkylene and X being as in (*a*) are chelating agents for heavy metals and are also active bactericides and fungicides.

U.S.P. 2,626,940 (23.8.51; 27.1.53). W. J. Sparks and R. M. Thomas, assrs to Standard Oil Development Co. A high mol. wt. tripolymer of a major proportion of a C_{4-6} mono-olefin, a minor proportion of a *cyclo*diene, and 0·1–5% of divinylbenzene.

U.S.P. 2,625,528 (6.4.51; 13.1.53). W. T. Cooper, assr to Phillips Petroleum Co. Plasticity of a rubbery sulphur-vulcanizable plastic substance containing unsaturated C to C bonds is increased by incorporating 1–50 wt % of a total residual oil by-product of dehydrogenation of a C_4 hydrocarbon at 1000°–1300° F to produce a less saturated C_4 hydrocarbon, the total oil being freed of components boiling $<300°$ F/1 atm.

U.S.P. 2,624,916 (19.2.51; 13.1.53). K. J. Persak, assr to E. I. du Pont de Nemours and Co. Glossy surfaced moulded articles are produced by moulding molten polyethylene in a metal mould lined with an insulating layer 0·5–5 mm thick of a urea-, phenol-, resorcinol-, or melamine-formaldehyde resin, an alkyd resin, or a mixture thereof, carrying a high polish, and cooling the polymer in contact with the layer.

U.S.P. 2,624,501 (25.11.50; 6.1.53). S. W. Ferris, assr to Sun Oil Co. Container for packaging milk formed from a fibrous sheet material coated with a paraffin wax having a m.p. 125°–132° F, a tensile strength at 70° F of *ca* 250 p.s.i. and at 40° F of *ca* 280 p.s.i., an oil content $<1\%$, and being completely distillable at 400°–650° F/10 mm Hg.

U.S.P. 2,625,471 (20.2.52; 13.1.53). D. T. Mowry and R. M. Hedrick, assrs to Monsanto Chemical Co. Soil conditioning fertilizer comprising finely divided plant fertilizer and finely divided polymeric water-sol polyelectrolyte derived by olefinic polymerization.

U.S.P. 2,625,529 (12.2.52; 13.1.53). R. M. Hedrick and D. T. Mowry, assrs to Monsanto Chemical Co. Improving the tilth of soil by incorporating in the soil in the presence of soil moisture 0·001–2·0% of a synthetic water-sol polyelectrolyte of average mol. wt. $<10{,}000$ derived by polymerizing <1 monolefinic compound through the olefinic group and substantially free of cross linking.

U.S.P. 2,624,745 (Switz. 7.4.48; 6.1.53). G. Schrader, assr to Farbenfabriken Bayer. Production of insecticidal compounds by reacting a dialkyl thiophosphoryl chloride with a negatively substituted phenol or hydroxy coumarin in presence of metallic copper and an acid binding agent in an inert solvent.

U.S.P. 2,626,960 (5.4.50; 27.1.53). M. W. Goldberg and W. E. Scott, assrs to Hoffmann-La Roche Inc. 1 : 4-Dioxo-5-(p-nitrophenyl)-1 : 4 : 4a : 5 : 8 : 8a-hexahydronaphthalene. Amoebide and fungicide.

U.S.P. 2,624,663 (28.8.47; 6.1.53). A. T. Centanni. Composition for promoting plant growth and preventing blight comprising methanamine 5, sodium phosphate 10, ammonium chloride 1, and iron ammonium citrate 0·5 or iron oxide 0·25.

U.S.P. 2,624,751 (23.3.51; 6.1.53). D. T. Mowry and A. H. Schlesinger, assrs to Monsanto Chemical Co. Allyl 2 : 2 : 2-trichloroethylidenecyanoacetate-selective herbicide.

U.S.P. 2,626,769 (30.7.48; 27.1.53). F. J. Wadman. Insecticide distributing apparatus for aeroplanes adapted for quick conversion from a liq spraying arrangement to a dusting arrangement and vice-versa. V. P. P.

U.S.P. 2,637,639 (G.B. 28.3.49; 5.5.53). F. Talbot and R. T. Foster, assrs to I.C.I., Ltd. Herbicidal compositions comprising a water-sol salt of 2-methyl-4-chlorophenoxyacetic acid and free alkali in an amount equal to 1·8–6% wt of the salt.

U.S.P. 2,637,640–5 (13.6.51, 31.10.51, 15.11.51; 5.5.53). N. Tischler and E. P. Bell, assrs to Sharples Chemical Inc. These all deal with plant growth regulating compositions containing various heterocyclic dicarboxylic acid derivatives.

U.S.P. 2,637,646 (24.1.52; 5.5.53). M. Kosmin, assr to Monsanto Chemical Co. Plant defoliant comprising an oil-in-water emulsion of 2-allylmercaptobenzothiazole.

U.S.P. 2,637,647 (24.1.52; 5.5.53). M. Kosmin assr to Monsanto Chemical Co. Herbicidal composition comprising an oil-in-water emulsion of 2-vinylmercaptobenzothiazole.

U.S.P. 2,637,662 (15.3.50; 5.5.53). R. N. Russell. Composition for treating cotton glove fabric containing 7% mineral oil, 4% lanolin, 3% stearic acid, 10% propyleneglycol, 1·85% triethanolamine, 15% terpineol–almond extract, and 2% quince seed gum, the balance being water, penetrant, and wetting agent.

U.S.P. 2,637,665 (20.7.50; 5.5.53). L. L. Dodge, assr (in part) to Highland Manufacturing Co. Aq sizing composition for conditioning paper for receiving printing inks and waterproofing compositions. The solids content of the sizing composition comprises 20–50% paraffin wax, 20–50% hydrogenated methyl ester of rosin, and 20–50% glycerol ester of hydrogenated rosin.

U.S.P. 2,637,676 (1.4.50; 5.5.53). L. A. Mikeska, assr to Standard Oil Development Co. Insecticidal compositions comprising a soln of 1 : 1 : 1-trichloro-2 : 2-(4 : 4′-diethoxy-3 : 3′-dimethyldiphenyl)-ethane or 1 : 1 : 1-trichloro-2 : 2-(3 : 3′-diethoxy-4 : 4′-dimethyldiphenyl)-ethane in a chlorofluoromethane.

U.S.P. 2,640,006 (28.10.50; 26.5.53). W. B. Ligett, R. D. Closson, and C. N. Wolf, assrs to Ethyl Corpn. Fungicidal compositions comprising an N-organo-lead-phthalimide, an inert carrier, and a surface-active agent.

U.S.P. 2,640,040 (21.11.49; 26.5.53). R. L. Lehman assr to Brogdex Co. Non-sweating stabilized compositions comprising a blend of 50–90% paraffin wax and 50–10% refined white mineral oil, to which is added 0·2–2% of a polyethylene having a mean mol. wt. between 3000 and 5000. J. M. S.

U.S.P. 2,640,800 (6.9.49; 2.6.53). D. L. Shatto, assr to California Spray-Chemical Corpn. An insecticidal dust composition comprising tetraethyl pyrophosphate and anhyd calcium sulphate as a stabilizer therefor.

U.S.P. 2,640,801 (8.4.50; 2.6.53). R. L. Burkhart and J. V. Vance, assrs to American Cyanamid Co. Ointment for treatment of bovine mastitis comprising 0·5–15% of aureomycin hydrochloride, 5–50% lanolin, and remainder a mixture of petrolatum jelly and liq petrolatum.

U.S.P. 2,640,847 (Ger. 7.5.49; 2.6.53). C. Schrader, assr to Farbenfabriken Bayer. Production of neutral esters of thiolphosphoric acid by slightly heating a mixture of an alkali salt of a dialkyl phosphite with an alkyl or substituted alkyl thiocyanate or alkylene dithiocyanate.

U.S.P. 2,641,563 (16.5.51; 9.6.53). J. B. Moore, assr to McLaughlin Gormley King Co. Insecticidal and acaricidal composition comprising propylene glycol and alkali ammonium sulpho sulphide.

U.S.P. 2,641,617 (16.2.50; 9.6.53). E. F. Rogers and H. D. Brown, assrs to Merck and Co. Insecticidal composition comprising a chlorination product of 1 : 1-diphenyl-2 : 2-dimethyl propane, *A* produced under conditions favouring ring substitution, of b.p. 160°–187° C/1 mm and Cl content >32 wt %, or the corresponding bromination product of b.p. 150°–187° C/1 mm and Br content $>40{\cdot}8$ wt %. In U.S.P. 2,641,618, *A* is produced by reacting 1 : 1-diphenyl-2 : 2-dimethylpropanol-1 with hydrogen in presence of a copper chromite cat.

U.S.P. 2,641,676 (Sweden 5.6.50; 9.6.53). S. A. W. Jewiling, A combined heater for liquefying waxy compounds for spray gun discharge and for heating the air to be used in the spraying process, comprising a container for the wax surrounded by an air heating chamber containing an electric heating element adjacent to the wall of the container. V. P. P.

U.S.P. 2,648,621 (11.5.48; 11.8.53). H. J. Gerjovich and M. Pijoan, assrs to Chemical Foundation Inc. An insect spray composition comprising essentially an insect spray base paraffinic hydrocarbon solvent containing a toxic amount of a mixture of mono-, di-, and tri-chloro-*n*-ethyl acetanilide.

U.S.P. 2,649,397 (31.5.50; 18.8.53). S. A. Ballard, assr to Shell Development Co. A fungicidal concentrate composition containing a substituted tetrahydropyrimidine having only hydrocarbyl substituents and having a hydrocarbon group of from 10 to 23 carbon atoms attached directly to the 2-position of the tetrahydropyrimidine ring, the composition also containing a surface-active agent suitable for dispersing the composition in water.

U.S.P. 2,650,181 (13.2.51; 25.8.53). D. D. M. Streed and J. M. Broadhurst, assrs to United States Rubber Co. A pressure sensitive adhesive composition comprising a thermoplastic copolymer of styrene and *iso*butylene, a pressure sensitivity-imparting component which is diethylene glycol or triethylene glycol esters of C_6 to C_{10} aliphatic saturated monocarboxylic acids, and a glycerin ester of hydrogenated rosin. D. A. R.

DERIVED CHEMICAL PRODUCTS

376. Synthetic phenol manufacture. Pt 1. P. W. Sherwood. *Petrol. Process.*, 1953, **8** (9), 1348–54.—By 1955 the production of phenol in the U.S.A., is expected to be approx 600 million lb. The cumene hydroperoxide process for the synthesis of

phenol has come to the fore since 1950. The economics of the process are extremely favourable, as the synthesis is suitable for the manufacture of phenol by using an alkylated benzene as starting material. The cumene route to phenol involves 3 fundamental chemical steps: isopropylation of benzene, auto-oxidn of cumene, and the decomposition of cumene hydroperoxide. Each of these steps is considered in detail by the author, and some of the process conditions are given. J. W. H.

377. Ethylene oxide and glycol. Anon. *Petrol. Refin.*, 1953, **32** (9), 154–6.—An account of the Shell process for the production of ethylene oxide by direct oxidn of ethylene, followed by thermal hydration to ethylene glycol if required. No process data are given, but a full costs-and-utilities summary is presented, and the properties and uses of the products are listed. R. D. S.

378. Economics of acetylene by Wulff process. T. Weaver. *Chem. Engng Progr.*, Jan. 1953, **49** (1), 35–9.—The Wulff process for the production of acetylene, by subjecting vaporizable hydrocarbons to high temp, at low partial pressures for short periods of time, is briefly described, and the cost of so producing acetylene is discussed in detail and compared with that of carbide acetylene. J. G. H.

379. Air and methane. L. F. Hatch. *Petrol. Refin.*, 1953, **32** (9), 170–2.—An account of the reactions of air and methane to produce ammonia, urea, methanol, or hydrogen cyanide and of the uses of these products. R. D. S.

380. Ammonia and urea. Anon. *Petrol. Refin.*, 1953, **32** (9), 178–80.—Short descriptions of the Casale synthetic ammonia process which operates at 9000–12,000 p.s.i.g., and the Pechiney urea manufacturing process, which uses a neutral oil circulating medium for recycling the unconverted carbamate. R. D. S.

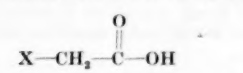
381. Ammonia and methanol. A. Christensen. *Petrol. Refin.*, 1953, **32** (9), 186–7.—A description of the N.E.C. process for the production of ammonia or methanol from hydrocarbon gases by controlled cat oxidn to form synthesis gas, which is fed to the main reactors. R. D. S.

382. Methanol. Anon. *Petrol. Refin.*, 1953, **32** (9), 190–3.—A description, with flow diagrams, of the Vulcan–Inventa process for the production of synthetic methanol from oil, coal, or natural gas. R. D. S.

383. From ammonia to hydrogen cyanide. N. Updegraff. *Petrol. Refin.*, 1953, **32** (9), 196–9.—An account of work done by the Freeport Sulphur Co, on a German process for the production of hydrogen cyanide from air, ammonia, and natural gas, and a description of the modified process which has resulted. R. D. S.

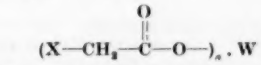
384. Patents. U.S.P. 2,647,861 (16.6.49; 4.8.53). W. M. Drout, Jr., assr to Standard Oil Development Co. Purification of ketones by dist.

U.S.P. 2,649,363 (13.7.49; 18.8.53). A. W. Swezey, assr to Dow Chemical Co. A method for the control of undesired plant growth which comprises contacting the leaf surfaces of the plants with a haloacetic acid compound of the group consisting of (1) monohaloacetic acids of the formula:



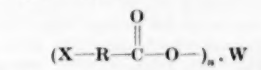
wherein X represents chlorine, bromine, or iodine, and (2) their water-soluble salts.

U.S.P. 2,649,364 (28.7.49; 18.8.53). R. N. Raynor and D. Steward, assrs to Dow Chemical Co. A method for promoting the maturing of crops and facilitating of harvest which includes the step of applying to the crops near the end of their normal growing season a water-soluble compound of the group having the formula



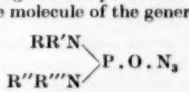
wherein X represents chlorine, bromine, or iodine, W is hydrogen or a salt-forming ion, and n represents an integer equal to the equivalency of W.

U.S.P. 2,649,365 (29.11.51; 18.8.53). R. N. Raynor and D. Stewart, assrs to Dow Chemical Co. A method for promoting the maturing of crops and facilitating of harvest which includes the step of applying to the crops near the end of their normal growing season a water-soluble compound of the group having the formula



wherein X–R– is a monohaloethyl radical, X represents chlorine, bromine, or iodine, W is hydrogen or a salt-forming ion, and n represents an integer equal to the equivalency of W.

U.S.P. 2,649,464 (G.B. 7.9.50; 18.8.53). G. S. Hartley and D. W. Pound, assrs to Pest Control Ltd. New phosphorus-containing organic compounds containing less than 11 carbon atoms in the molecule of the general formula:



where R and R″ are each a C_2–C_4 alkyl group or hydrogen, and R′ and R‴ are each an alkyl group containing less than 5 carbon atoms.

U.S.P. 2,649,622 (20.12.49; 25.8.53). J. A. Piccard, assr to E. I. du Pont de Nemours and Co. A process of moulding articles from amorphous polyethylene teraphthalate by heating the material in the mould at a temp of from 120° to 220° C, and under pressure of at least *ca* 100 lb until the material crystallizes, whereby to form the desired moulded article.

U.S.P. 2,650,198 (Netherlands 16.3.50; 25.8.53). W. Krönig, H. Seeles, and H. Burmeister, assrs to Shell Development Co. A process for the preparation of an oil soln of ammonium petroleum sulphonates. D. A. R.

COAL, SHALE, AND PEAT

385. Studies in shale oil. Pt VII. Some miscellaneous studies. G. E. Mapstone. *J. Inst. Petrol.*, 1953, **39**, 354–79.—The tar bases isolated from shale naphtha are similar to those in cracked shale gasoline, except that they are free from olefinic homologues. Indoles have been detected in shale oil, and a new test for indoles (or pyrroles) is described based on the formation of a brownish purple colour with quinone. Some properties of the coke and residuum from the thermal cracking of crude shale oil are given. A. R. W. B.

386. Patent. U.S.P. 2,650,190 (G.B. 21.6.49; 25.8.53). M. Steinschlaeger. Carbonization of peat with the utilization of excess heat to produce surplus power. D. A. R.

MISCELLANEOUS PRODUCTS

387. Rubber and synthetic rubber compounds for automotive and aeronautical applications. N. L. Catton. *ASTM Bull.*, Feb. 1953, **188**, 20–1.—The 1952 SAE–ASTM specifications for rubber and synthetic rubber compounds for automotive and aeronautical applications are summarized and changes from earlier versions indicated. The additional quality requirements which may be specified in addition to basic specification details are set out in full. J. G. H.

CORROSION

388. Five common corrosion problems. Anon. *Petrol. Process.*, 1953, **8** (9), 1332–5.—Practical solutions are given to the following 5 common corrosion problems. In each case the materials in use on the plant are quoted and the process conditions given: (1) preheater exchanger fins corroded by hot, sulphurous gas oil; (2) caps, trays of topping oil unit corroded by overly acid crudes; (3) reboiler tubes pitted by oxidn products, high temp; (4) eductors on gasoline treaters worn by abrasives, oxidizers; (5) elbows, header in gasoline condenser attacked by HCl. J. W. H.

389. Casing corrosion in West Texas–New Mexico. R. L. Elkins. *Corrosion*, 1953, **9** (9), 321–4.—The corrosion occurs in the gas-filled portion of the tubing-casing annulus, and is due to condensed water with dissolved acid gases. It is prevented by filling the annulus with non-corrosive liq, usually inhibited crude oil or mud. The use of ammonia and periodic flushing with inhibited crude are being investigated. K. G. B.

390. Studies on water-dependent corrosion in sweet oil wells. H. E. Greenwell. *Corrosion*, 1953, **9** (9), 307–12.—This form of corrosion occurs in many sweet wells when the proportion of water produced exceeds 20–40%. The main cause is thought to be carbon dioxide, but other agents are suspected. An important factor is the critical water–oil ratio at which the metal is wetted by water. Preventive methods are the use of adsorptive-type inhibitors and wetting agents. K. G. B.

391. Corrosion of casing in oil and gas wells. J. L. Battle. *Corrosion*, 1953, **9** (9), 313–20.—Casing corrosion is causing large losses in the U.S. oil industry. This paper summarizes causes of both external and internal corrosion, and indicates the remedies. K. G. B.

392. Mechanism of fretting. I. M. Feng and B. G. Rightmire. *Lubric. Engng*, June 1953, **9** (3), 134–6, 158–61.—A new theory for the mechanism of fretting corrosion is presented. This, it is suggested, is merely a special case of wear, in which, because of the small amplitude of relative motion, wear is highly concentrated on the areas of actual contact, the wear product is trapped and accumulated between contacting areas, resulting in accelerated wear by abrasion; also oxidn of wear particles further accelerates the abrasive action. Experimental results obtained by the authors and other investigators are described and cited in support of the theory. J. G. H.

393. Cast high alloys. E. A. Schoefer. *Chem. Engng*, 1953, **60** (10), 298–314.—These are a group of ferrous materials containing nickel and/or chromium that constitute 8% or more of the total composition. Information is given about these alloys regarding their physical and mechanical properties and corrosion resistance. D. M.

394. General Motors Research Corrosion Test: a cyclic humidity accelerated corrosion test for sheet steel. A. J. Opinsky, R. F. Thomson, and A. L. Boegehold. *ASTM Bull.*, Jan. 1953, **187**, 47–53.—A new type of accelerated corrosion test adapted to study the corrosion resistance of bare steel specimens for those applications where the protective rust of specimens exposed on outdoor racks is not fully realized. The testing cycle comprises a slow humidity cycle, an elevated temp, and exposure to a corrosive soln of dilute sodium and calcium chloride; corrosion resistance is evaluated by measurement of loss of wt at the conclusion of the cycle. The preparation of specimens, the testing equipment used, and the final cleaning of the specimens prior to weighing are described in some detail. Results obtained show a high degree of precision and reproducibility, and correlate well with results obtained by much longer tests. J. G. H.

395. Corrosion in CO_2–H_2S–amine system. E. C. Carlson, G. R. Davis, and K. L. Hujsak. *Chem. Engng Progr.*, July 1952, **48** (7), 333–6.—Increased utilization of natural gas from sour gas areas, resulting in an increased number of plants using amine systems for gas sweetening, has witnessed severe corrosion problems in the sweetening system. Operating conditions in such a system simulated on a pilot plant scale, revealed that the metal attack could be reproduced when the amine contained small residual amounts of both CO_2 and H_2S and the heat medium oil was at a temp of 500° F. Reduction of the oil temp to 370° F practically eliminated the corrosion, indicating that excessive metal temp due to the heating medium was the principal factor in tube corrosion by the stripped amine solution. J. G. H.

396. Patents. U.S.P. 2,647,839 (16.9.49; 4.8.53). W. A. Zisman and H. P. Baker. A water-displacing corrosion-inhibiting composition consisting essentially of more than 90% by wt of at least one C_{4-8} aliphatic monohydric alcohol and a polar type rust inhibitor which has a water solubility not exceeding 3% by wt and is substantially non-volatile at temp below 150° C.

U.S.P. 2,648,643 (G.B. 15.8.49; 11.8.53). W. H. Adams and W. D. Ervine, assrs to Standard Oil Development Co. An anti-corrosion composition consisting essentially of 1–10 parts by wt of microcrystalline wax of m.p. between 135° and 210° F, 3–15 parts of mineral base lub oil, 0·01–0·05 part of a predominantly *iso*butylene polymer of mol. wt. between 20,000 and 200,000, 0·05–5 parts of the Friedel–Crafts condensation product of chlorinated wax and naphthalene, 0·5–2 parts of a corrosion inhibitor comprising oil sol metal petroleum sulphonate and lanoline, and 20–100 parts of a hydrocarbon solvent having a b.p. between 40° and 190° C.

U.S.P. 2,649,415 (30.12.49; 18.8.53). R. L. Sundberg, C. P. Albus, and J. H. Cross, assrs to General Aniline and Film Corpn. A corrosion inhibiting composition for use in the treatment of metals with acid baths. D. A. R.

ENGINES AND AUTOMOTIVE EQUIPMENT

397. Improved system for control and measurement of air consumption of a single cylinder engine. W. Cornelius and J. D. Caplan. *S.A.E. quart. Trans.*, Oct. 1952, **6** (4), 666–76.—A new system of accurately measuring the air consumption of a single-cyl test engine, utilizing the principal of sonic flow of gas through a convergent nozzle, is described. This makes possible the measurement of air consumption to an accuracy of 1% under all operating conditions, as compared with errors of up to 20% using conventional orifice meters. This system also facilitates the maintenance of constant inlet air pressure, temp, and humidity, regardless of prevailing atmospheric conditions, whereas conventional systems fail to isolate engines "breathing" from atmospheric variations. The new technique is not applicable to multi-cyl engines in that they produce a steady state of airflow through conventional orifice meters. J. G. H.

398. Cruise control procedures for turbine-engined aircraft. H. Wittenberg. *Ingenieur, 's Grav.*, 4.9.53, **65** (36), L27–32.—The variation of fuel consumption with altitude and speed for turbine-powered aircraft is discussed and compared with the properties of piston-engined aircraft. The several methods of cruise control are explained with the aid of a cruising grid. The climbing flight at constant true airspeed and constant

turbine r.p.m. appears to be the best method of cruising. The gain in fuel consumption and pay-load for this method as compared with flight at constant altitude or at constant indicated airspeed is illustrated by means of an example. The cruising properties of the turbine aircraft are found to be similar to those of jet-powered aircraft as regards the influence of air temp and altitude on the engine performance.
G. F. T. C.

399. Patents. U.S.P. 2,647,364 (10.9.48; 4.8.53). L. L. Dreibelbis, assr to M. W. Kellogg Co. A jet propulsion device adapted to employ a liq propellant made up of a plurality of components which ignite spontaneously upon contact with each other.

U.S.P. 2,647,366 (24.6.46; 4.8.53). W. J. McCann. Means for preventing ice formation in jet propulsion and gas turbine engines by using exhaust gas heat.

U.S.P. 2,647,368 (France 8.5.50; 4.8.53). H. Triebbnigg and O. David, assrs to Hermann Oestrich. A method of operating a gas-turbine of the type having internally air-cooled ducted blades and an after-burner, by feeding into the air-ducts of the blades a cooling mixture consisting of air and an atomized cooling liq which includes a combustible fuel component so that the cooling mixture issuing from the air ducts may be subjected to post-combustion in the after-burner.

U.S.P. 2,647,369 (France 6.9.46; 4.8.53). R. Leduc. A combustion chamber for fluid fuel burning in an air stream of high velocity comprising a tubular outer wall; a plurality of annular baffles co-axially arranged with respect to the outer wall and forming a plurality of co-axial open-ended chambers; fuel burners arranged in the chambers; and guide vanes arranged at the entries of the chambers, the guide vanes being arranged in groups having right and left handed inclinations alternating circumferentially.

U.S.P. 2,647,372 (G.B. 29.8.46; 4.8.53). L. F. R. Fell, assr to Fell Developments Ltd. A power unit for a locomotive comprising at least 2 main I.C. engines, a transmission mechanism including a fluid coupling, means for braking the output member of the coupling, and a differential gear through which the torque is transmitted from each of the main engines to the driving wheels of the locomotive.

U.S.P. 2,647,496 (10.4.51; 4.8.53). L. R. Carpenter. 2-cycle I.C. engine having special cooling means therein.

U.S.P. 2,647,497 (Germany 15.8.49; 4.8.53). E. Stump, assr to Daimler-Benz A.G. A liq cooled I.C. engine having a cyl block and a cyl head containing a precombustion chamber and valve chambers extending in the cooling jacket thereof, and means provided in the cyl to direct cooling liq streams towards the hottest spots of the cyl head.

U.S.P. 2,647,498 (17.6.47; 4.8.53). H. J. Hickey. An I.C. engine, having opposed pistons and pressure-fluid-operated means to vary the stroke thereof.

U.S.P. 2,648,190 (5.3.48; 11.8.53). H. Maisner, assr to Aerojet-General Corpn. The method of initiating the decomposition of a liq nitroparaffin propellant which comprises spraying the liq nitroparaffin on the surface of solid lithium aluminium tetrahydride.

U.S.P. 2,648,191 (20.8.51; 11.8.53). J. Featonby, assr to National Research Council. Means for varying the effective outlet area of the exhaust duct of a heat power reactor.

U.S.P. 2,648,192 (27.9.49; 11.8.53). J. G. Lee, assr to United Aircraft Corpn. In a jet propulsion unit for an aircraft, an exhaust nozzle for discharging a propulsive jet stream from the unit and a variable capacity ejector mechanism for withdrawing air from without the unit into the stream.

U.S.P. 2,648,196 (18.3.47; 11.8.53). J. W. Mullen and J. B. Fenn, assrs to Experiment Inc. Ram jet burner with aq injection to promote smooth burning.

U.S.P. 2,648,197 (6.1.51; 11.8.53). F. H. Keast and F. D. M. Williams, assrs to A. V. Roe Canada Ltd. A vaporizer system for a combustion chamber into which liq fuel is introduced and burned as a vapour in an air stream flowing in the combustion chamber.

U.S.P. 2,648,353 (G.B. 17.5.50; 11.8.53). L. Hawarth, assr to Rolls-Royce Ltd. Exhaust duct structure for gas-turbine engines.

U.S.P. 2,648,950 (24.8.49; 18.8.53). E. F. Miller, assr to Westinghouse Electric Corpn. Gas turbine engine apparatus designed to burn wet pulverized fuel.

U.S.P. 2,650,073 (25.6.49; 25.8.53). S. Holm, assr to Air Preheater Corpn. Combined regenerator and precooler for gas turbine cycles.
D. A. R.

MISCELLANEOUS

400. How to prepare cost estimates. H. Bottomley. *Petrol. Refin.*, 1953, **32** (9), 211–14.—A discussion of the important factors in preparing cost estimates.
R. D. S.

401. Oil, a $44 billion industry in 1953. Anon. *Petrol. Refin.*, 1953, **32** (9), 91–2.—A breakdown of U.S. petroleum industry expenditure and investment, in property, plant, etc., during 1946–52 under major departmental headings such as production, refining, transportation, etc.
R. D. S.

402. Accent is on premium octanes. V. B. Guthrie. *Petrol. Process.*, 1953, **8** (8), 1157–8.—Forecasts are given of premium grade motor fuel octane numbers to be expected from the refining industry in 1954. An increase in the O.N. rating will be possible because of the development of the commercial cat reforming processes for upgrading the lower O.N. gasolines made by thermal and cat cracking.

The role cat reforming will play in allowing the refiner to achieve the anticipated octane values has been reported at an API meeting, and the important points brought out at this meeting are fully discussed.
J. W. H.

403. How inventory costs affect your process economics. H. E. Schweyer. *Chem. Engng*, 1953, **60** (10), 188–92.—A fundamental approach to the problem of how storage and interest charges on materials in inventory influence optimum length of run.
D. M.

ERRATA

Abstract **24**. In regard to oil developments in Pakistan, the number of successful wells drilled in 1952 was 2 and not 8 as stated.

BOOK REVIEWS

A Texas Wildcatter. Lucille Glasscock, San Antonio, Texas: The Naylor Co., 1953. Pp. 126. $2.50.

From the earliest days of civilization the search for treasure has lured men into unknown waters and across uncharted wastes of land, and their stories have been told in legend, in history, and in literature. But little has been told of the pioneers who sought black gold, and, in finding it, changed the face of the world. Not the tycoons who made their names and fortunes in selling oil, but those who drilled where their hunches led them, and followed the mad scramble for the underground treasure.

This is the story of one of the unknown army who was present at the birth of many of the Texas fields now household names—Wichita Falls, Joiner, Ranger, Yates, and Hendrick.

The tale is pleasantly told by the wife of Gus Glasscock, who started in a circus, and by way of mule skinner, tool dresser, derrick hand, and driller became finally company owner. Here we are introduced to the wild excitement among the pioneers in Texas following the first world war at the thought of fortunes under their feet—for the finding—the odds against a producer being only 10 to 1, and the prize, in one case, $3 million in 3 months.

Life was no easy matter for a wife with young children in wild, lawless, comfortless boom towns, ever on the move, with money sunk in a dry hole, perhaps a small producer.

We share the excitement when a bonanza is discovered and the fear and desperation when a well catches fire, and there is humour, as in the story of the man who invested his savings in a "doodle bug" to locate oil, threw it away in East Texas because it always recorded oil wherever he tried it out, and came back later to find derricks at these places.

We catch something of the inner urge of the man himself, of the compulsion to look for oil, because it is there, and are not surprised at the end of the book when instead of retiring, Gus decides to drill under water—a new horizon.

The story is a moving human document written in easy, lucid style, and provides a memorable background to the early days of the oil industry. C. L. G.

Formaldehyde. J. Frederic Walker. 2nd Edition. A.C.S. Monograph No. 120. New York: Reinhold Publishing Corpn., 1953. Pp. 575 + xvi.

The first edition of this excellent monograph was published nine years ago, and the new edition follows the original general lines with an overall increase of about 40 per cent in the amount of information presented. Certain topics, such as the production of formaldehyde, handling and properties of solutions, and chemical reactions with hydrocarbons and nitrogen-containing compounds, have received fuller treatment in proportion, and a completely new chapter has been introduced to cover reactions with heterocyclic compounds.

Although the direct application of formaldehyde and its derivatives in the petroleum industry accounts for a comparatively small offtake, the production of formaldehyde in the United States is now dependent to a large extent on petroleum. In 1948 about 20 per cent was derived from the direct oxidation of hydrocarbon gases, the remainder being produced principally from methanol: also 77 per cent of the carbon monoxide employed for methanol synthesis was made from natural gas. Thus, this book can be regarded as another series of chapters on the petroleum chemicals industry.

The monograph deals systematically with the production, properties, reactions, and applications of formaldehyde, and includes a detailed and clear exposition on formaldehyde polymers. Methods of analysis are treated comprehensively, and the chapters on chemical reactions constitute a valuable introduction to the subject: numerous references are provided, including a fair proportion of the patent literature. However, the patent references to the work of Reppe *et al* on acetylene might to advantage have been supplemented by Allied Intelligence Reports.

There is a wealth of published literature on the practical aspect of the major utilization of formaldehyde–synthetic resin manufacture (via reaction with phenols, urea, melamine, etc.), which it would not be practicable to cover in the detail afforded to other topics. For that reason, the chapter on resin applications is a comparatively brief survey, although it is supported by an earlier, very extensive treatment of the chemistry involved.

The pages on other applications are very informative, and there are ample references for readers who wish to study further such varied topics as the technique of RDX production, leather tanning processes, and the compositions of embalming fluids. A concise statement is included on the uses of formaldehyde in connection with the petroleum industry. Among the examples given are preservative action in drilling fluids, prevention of corrosion by hydrogen sulphide in well brine, removal of unsaturated compounds from petroleum fractions, and a selection of the hydrocarbon addition agents which involve formaldehyde in their synthesis.

One or two indexing slips were noted, but generally the book is the first class production which is taken for granted in the A.C.S. Monograph series. R. S. A.

Trinidad's Oil. The Petroleum Association of Trinidad. Pp. 73.

Of late years the oil industry has taken an ever-increasing interest in public relations. Co-operation with the general public has been a natural follow-on to co-operation within the industry. Political conditions have speeded up the tempo of this instruction.

The Trinidad oil industry has in its own words "been misunderstood and misrepresented for too long." It has co-operation within itself in the form of the Petroleum Association of Trinidad, of which all Companies operating on the island are members. On their behalf the Petroleum Association established public relations by granting interviews to the Press during 1950 and 1951 which gave rise to a series of instructive articles in two leading Trinidad newspapers. These articles had the declared objective of dispelling misunderstandings and putting the picture of the Trinidad oil industry in its proper perspective.

As these articles proved to be popular with the Trinidad reading public, the Petroleum Association went one step further by collecting them together in book form and adding a preface by the Governor of Trinidad and Tobago and a map of Trinidad illustrative of the oil industry's activities on the island. The preface makes clear the dominant position of the oil industry in the island's economy.

The articles have been assembled in accordance with the flow of the industry's activities: The Origin of Trinidad's Oil Industry; Trinidad's Place in the World Oil Industry; Geological Exploration; Geophysical Exploration; The Cost of Searching for Oil; Where Trinidad's Oil Comes From; What is an Oil Well?; Wildcat Drilling; Exploration and the Public; How Deep can we Drill?; Conservation of Trinidad's Oil Reservoirs; Refining Trinidad's Oil; Marketing the Refined Products; The Financial Aspect; The Human Factor; Training for a Career in the Industry.

The articles are short, descriptive, and well illustrated. The scope, as the titles would indicate, is comprehensive. The matter is a blend of statistics and instruction. The press have given a good recording, even though to the technically trained mind they have delved deeper into higher technical questions than appeared desirable.

To those who have operated in the island it will bring back memories. To those who have not had that opportunity it will make clear that Trinidad is one place where oil location is not the simple procedure of following established practice. To all it presents useful informative articles on a comprehensive range of the oil industry's activities.

This publication is deserving of a wider circulation than the West Indies. Trinidad's public relations problem is a general problem throughout the industry. Others might benefit in the development of their public relations from a reading of this book. J. S. P.

Modern Mass Spectrometry. G. P. Barnard. London: Institute of Physics, 1953. Pp. 326. 50*s*.

This book, which surveys the whole field of mass spectrometry, makes a valuable addition to the "Physics in Industry" series.

The first five chapters deal with the theory and design of mass spectrometers, and therefore will have no special appeal to the average scientific reader. However, the next five chapters present a very good overall picture of the capabilities and usefulness of the mass spectrometer to industrial and academic problems, and should be widely appreciated.

It is very refreshing to find those aspects of mass spectrometry which are still highly controversial both in and out of print, *e.g.* ionization processes, surface effects, and high vacuum systems, discussed in relation to the most modern theories. No doubt, as the author remarks, much of the somewhat tentative work that is described will stimulate progress in many fields.

This is a very good book, containing, in addition to some 400 references, an appendix which refers to 30 reviews of mass spectrometry published since 1940. It should appeal not only to the mass spectroscopist but also to the more general scientific reader. H. P.

Lubricant Testing. E. G. Ellis. Wellington, Shropshire: Scientific Publications, 1953. 37*s*. 6*d*.

Of all the products made from crude petroleum, lubricants undoubtedly have demanded the most elaborate system of testing. Thus, in IP Standard Methods for Testing Petroleum and Its Products over a third of all the methods described have been devised for, or are used for, the examination of lubricants, and these are by no means all the methods of test in common use. Many originated in official Government specifications, and have not yet been included in any standard reference book, while for others, such as the C.R.C. Test, one must seek information in the appropriate publication. The author of this book has, therefore, satisfied a real need in collecting all these test methods together, describing them in more or less detail, and discussing their significance.

The book is divided into ten chapters and contains a number of appendices. Chapter 1 is entitled "Fundamental Properties," and besides covering such properties as density, colour, refractive index, etc., has something to say on wetting and spreading—factors which are of great importance in lubrication. Chapters 2 and 3 deal with problems of flow and are, of course, mainly concerned with viscosity determinations. The author describes most of the capillary viscometers in present use, and follows this by a review of viscosity–temperature relationships and methods of expressing these. The flow of lubricating greases is also considered in some detail, commencing with the conventional penetrometer and proceeding by way of the work of Bingham, Arveson, and Blott to the more fundamental approach.

There follows a short chapter on "quality" tests—cleanliness, acidity, ash, etc., of oils and greases, and then two chapters on tests of behaviour in which the author covers such properties as pour point, melting point, flash point, volatility, carbon residue, oxidation, spontaneous ignition temperature, etc. Most of these tests are to be found in Standard Methods, but in the case of spontaneous ignition temperature no satisfactory method has yet been evolved, and the author wisely does not describe any procedure in detail. There is a brief reference to the mechanics of oxidation, with particular reference to the hydro-peroxide theory.

A chapter entitled "Composition" (Chapter 7) contains methods for the examination of used oils and the analysis of greases, and also has something to say on the presentation of data and methods of reporting. Analysis of greases is a complicated business, and although a method appears in the ASTM Standard Methods, the introduction of new types of greases makes it difficult to keep this up-to-date. No book dealing with lubricants could fail to describe somewhere the theories of friction, and Chapter 8 follows the usual lines in describing the work that has been carried out by Hardy, Bowden, and many others. Readers will find in this chapter useful descriptions of most test machines used for examining E.P. lubricants, which information has not previously been gathered together in one book.

The same can be said for Chapter 9 on functional tests, which describes a number of rigs and machines mainly used for the testing of greases. These rigs have in many cases been designed by bearing manufacturers, and information concerning them has previously been somewhat difficult to obtain. Finally, we have a chapter, perhaps a rather short one, on engine testing of lubricating oils. This, to-day, is a very important aspect of lubricant testing, and it is rather surprising that it has not been given more prominence in this book. Strangely enough, this chapter contains the only reference to the Sunbury Beaker Corrosion test, which is not an engine test but a laboratory test of growing importance.

Useful appendices give full details of various grease rigs and special methods for testing greases.

The book is well printed, and all chapters are followed by a list of references to the matter discussed. There are a number of illustrations, some of them, perhaps, being unnecessary in a work of this description. Thus the illustrations of a stop-watch, a standard penetrometer, and a precision electric timer do not add anything to the value.

The reviewer regrets the spelling "phosphorous" (page 89) for the element "phosphorus." D. L. S.

Production of Drilling and Refining Equipment in U.S.A.: O.E.E.C. Report of a Group of European Experts. Paris: O.E.E.C., 1953. Pp. 130. 10*s*. 6*d*.

In a somewhat unusual method of presentation, data collected by a group of specialists selected to study American petroleum methods is submitted in condensed form for general information. The mission of 18 included representatives of Belgium, France, Italy, Netherlands, and the U.K., and during an absence of some months visits were paid to 50 leading establishments spread over nine States in the U.S.A., where many classes of work associated with petroleum production and processing were studied, together with the necessary equipment manufactured or used.

The objectives of the mission are clearly stated in a general introduction as:

A. *Refining.*—1. Study of the design and planning of refineries and specialized plant for the treatment of petroleum products. 2. Specification of equipment required. 3. Technique adopted by the manufacturers of machinery.

B. *Drilling.*—1. Study of drilling equipment on oilfields situated in different geological areas. 2. Study of the technique used by manufacturers of equipment and machinery.

The co-ordination of the assembled data must have proved a stupendous task, and it has been divided into four sections covering various classes of equipment. Part 1

explains the method of approach and excuses deficiencies on the score of limited time available for detailed study; Part 2, covering Refinery Equipment, is divided into eight chapters; Part 3 covering Drilling Equipment, has three sub-divisions; and Part 4 General remarks and conclusions.

So many factors favour the American manufacturer, that it is manifestly difficult to make a just comparison of American costs and methods with those in Europe. With such a wide choice of location for works with due relationship to demand, climate, water facilities, fuel, or power resources, U.S. industrialists are at a great advantage as compared with those operating in the U.K. or much of Europe. The existence of a large local market for certain goods favours specialization, standardization, and mass production methods on a scale inapplicable to Europe. However, several important conclusions were reached that have a bearing on European manufacturing methods and costs in which the human element largely figures. The more important under the latter heading are: (*a*) attention to staff comfort; (*b*) collaboration between workers and executives; (*c*) co-ordination of departments; (*d*) research laboratories and educational facilities; (*e*) mechanization of duties formerly performed by hand; (*f*) servicing of supplied equipment and maintaining contact with purchasers; (*g*) circularizing customers with attractive, illustrated catalogues or brochures.

Attention is drawn to the many ways by which the convenience and comfort of workers is considered in such matters as lighting, heating, ventilation of works and offices, and the feeding, recreation, and social amenities of those employed. It is suggested that a contented labour force engenders friendly intercourse with management and a higher throughput. This, coupled with a quick adoption of new methods, more output per machine, and the frequent introduction of more efficient machine tools, tends, it is submitted, to cheapen production more than in Europe, where manufacturers are more reluctant to scrap old tools and make changes or innovations.

Those studying refinery plant paid special attention to such problems as corrosion, insulation, refractories, and the employment of improved metallic alloys to meet exacting temperature and pressure conditions. Safety devices, measuring and registering apparatus, and testing implements were specially noted, and a mass of useful data has been collected and presented concerning metals and their tempering and working to suit particular purposes. It is remarked that American firms can obtain quicker delivery of materials than in Europe, and that in consequence they carry far lower stocks. The 60 odd pages of matter devoted to refinery problems are chock-full of useful data about materials and plant employed in a refinery, and the modern trend of choice is enunciated. In one single refinery inspected, no less than 700 products were being produced, circulated, and processed.

Some 31 pages are devoted to the consideration of rotary drilling equipment as the result of inspections of the works of some of the largest producers of oilfield equipment. Valuable hints concerning the methods used to cheapen production and ensure strength, quality, and reliability of goods are found on almost every page, and remarkable examples of speed in machining, welding, and the like are given. The latest methods adopted to produce drill pipes, collars, and the many types of rock and core bits in use are followed by a critical examination of slush pump fabrication to meet the exacting field conditions. Problems connected with the manufacture of sub-surface pumps and sucker rods for deep wells are discussed on page 112.

From the context of this publication, it becomes apparent that European manufacturers of petroleum equipment must always be at a disadvantage in being distant from important centres of oilfield activity. Those within easy reach of users are able to watch their equipment at work and consult with field operators. This applies less to refineries than to oilfield plant. Drilling units in operation are given as 4400 in America, compared with 180 in Europe; but apart from this discrepancy it is suggested by the authors that greater attention than that usually given is needed to secure the quality of material, workmanship, interchangeability of parts, and inspection of goods subjected to harsh treatment in the field, where failures endanger life and often lead to catastrophic consequences.

Those engaged in the design and manufacture of petroleum equipment will find much to interest them, especially if unacquainted with American methods and labour conditions.

A. B. T.

Petroleum and Performance. E. M. Goodger. London: Butterworths Scientific Publications, 1953. Pp. 295. 32*s.* 6*d.*

At the outset it should be stated that, although the title suggests a wider basis, only internal combustion engine *fuels* are considered in the book.

The first section includes: a chapter on the winning of crude oil which will be interesting to the uninitiated, although not very relevant to the purpose of the book; chapters of types of hydrocarbons and the production of petroleum fuels, which provide a useful background for engineers and other non-specialists in petroleum chemistry; and a chapter of fuel properties and testing, which could be extended with advantage.

The second section commences with a chapter on thermodynamics and engine theory; this includes all the essentials in an abridged form suitable for reference purposes rather than for detailed study, as it is assumed that the reader will have a working knowledge of the subject. The chapters on combustion are full and informative, as well as being a useful source of reference. Fuel rating is mainly confined to laboratory methods, and has an American bias; inclusion of more data on road testing techniques and other aspects of fuel performance than knock rating would be an advantage. The information on the performance testing of gas turbine fuels is very scanty; the addition of an example calculation of combustion efficiency would be helpful.

Specialist chapters on mixture behaviour in the manifold and fuel spray atomization are over full in relation to the sparse information on other important aspects of performance such as cold starting, exhaust smoke, and deposit formation. The chapter on applications and specifications which should be one of the most important in the book is far too brief, and could well embody much more material. The book concludes with useful appendices and an excellent index.

The author set himself a difficult task in producing a small work of reference covering the wide field of performance aspects of fuels for all types of internal combustion engine, including gas turbines, ram jets, rockets, etc., together with the essential information on the engines themselves. The result is a book which should have a wide appeal, particularly as a starting point for further study, as each chapter has a full and well-selected bibliography. Lack of balance in the space allotted to the different aspects of performance and to the standard of knowledge expected of the reader for the various chapters, is the major criticism.

J. G. W.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

404. Some theoretical considerations of tilted water tables. S. T. Yuster. *J. Petrol. Tech.*, May 1953, **5** (5), *AIMME Tech. Paper No.* 3564, 149–56.—Tilted fluid interfaces are not uncommon. A static factor which may cause inclination is a change in pore size. For a density differential of 0·1, porosity 20%, interfacial tension 20 dynes/cm, and contact angle 60°, a permeability change from 1000 to 1 mD is calculated to involve a rise of 330 ft for the water table. Other static factors are variations in interfacial tension, contact angle, and fluid density.

It seems unlikely that the rate of tilting of the formations would ever be such as to create significantly inclined fluid interfaces. Fluid flow may cause interface tilts. Such tilts may arise from natural water flow or by fluid extraction or injection. G. D. H.

405. Relative permeability calculations from pore size distribution data. N. T. Burdine. *J. Petrol. Tech.*, March 1953, **5** (3), *AIMME Tech. Paper No.* 3519, 71–8.—Formulæ are developed and a procedure is outlined for computing wetting and non-wetting phase relative permeabilities in 2-phase systems from pore size distribution data. The tortuosity factors are assumed to be linear functions of the saturation. Calculated values of relative permeability are compared with experimental results. From a study of resistivity measurements as used for measuring the tortuosity factors it is inferred that the " effective " ion path is less than the fluid flow path. G. D. H.

406. Deposition of evaporites. P. C. Scruton. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2498.—Modifications are suggested to previous theories regarding the deposition of thick salt beds. A description is given of certain hydrographic conditions in estuaries in both humid and arid regions which have been found by recent oceanographic studies. These studies are utilized to elaborate on known characteristics of salt-depositing evaporating pans, and to infer a depositional sequence of evaporites which suggest explanations for some of the features of known beds. E. N. T.

407. Use of ostracod micro-faunas in the detail stratigraphy of the Jurassic–Cretaceous transition (continental facies). N. Grekoff. *Rev. Inst. franç. Pétrole*, July 1953, **8** (7), 362–79.—It has been long known that the ostracods were of great value in the study of the Wealden in which there was the absence of true marine forms such as foraminifera. The stratigraphy and most important ostracod content of certain late Jurassic–early Cretaceous beds is described for certain areas in Europe, Equatorial Africa, and North and South America. Tables show the forms present in various stages in the different areas. Certain forms appear to have a restricted range in time, but very considerable spread geographically. It also seems that the so-called Wealden facies may be appreciably younger in the Americas and West Africa than in Europe.

The forms mentioned are listed with suitable references, and a map shows the locations of the continental facies of the Jurassic–Cretaceous transition with ostracods. G. D. H.

408. Artificial formation fracturing in southern Oklahoma and north-central Texas. W. L. Sallee and F. E. Rugg. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2539.—This report describes in detail the results that have been obtained in southern Oklahoma and north-central Texas through the methods used in artificial fracturing of formations to improve oil production.

Over 2000 fracturing reports were studied to make this report, and most of the work done in this area was in sands of Pennsylvanian age.

Statistics are presented to demonstrate the economic significance of the fracturing process, and from the data studied, more than 85% are considered economically successful. E. N. T.

409. Co-ordination of seismic and geologic data in Poza Rica–Golden Lane area, Mexico. D. W. Rockwell and A. G. Rojas. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2551.—A brief history of exploration of the Golden Lane fields is given, followed by the nature and geologic interpretation of seismic data, and sections are shown to illustrate this.

From the initial discovery in 1908 until 1927, production was extended to San Isidro, south of the Tuxpan River, and from 1942 new gravity and seismic surveys were made which extended production southwards, and in 1952 the Ezequiel Ordonez field was discovered. The total production to date from the Golden Lane oilfields, which are located along the crest of a buried Lower Cretaceous ridge south of the Tampico, is 1120 million brl. E. N. T.

410. Jefferson Island salt dome, Louisiana. R. Balk. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2455.—This paper follows a companion report on the internal structure of the Grand Saline salt dome, Texas. The Jefferson Island salt dome is a slender column several miles high, with nearly vertical walls. The interior of the dome consists of many large and small folds, ranging from open to isoclinal position of the vertical limbs, and near the border lenses of sandstone have been folded with the salt.

A description is given of the megascopic and microscopic features of the salt, and it is stated that vertical lineation, shown by distorted halite crystals and preferential orientation of the longest body axes of anhydrite crystals, is common. There is, however, also coarse-grained, massive salt, locally with large poikiloblasts of halite.

The mode of origin of the salt dome is mentioned, with special reference to problems of crystal deformation and recrystallization in salt domes, glaciers, and some granitic massifs. E. N. T.

411. Paleozoic history of south-eastern Colorado. J. C. Maher. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2475.—The author concludes that Paleozoic seas first covered south-eastern Colorado during late Cambrian time, when coarse clastics were deposited in front of a low land mass that extended from New Mexico north-west to the vicinity of Cañon City. Additional Upper Cambrian (Bonneterre dolomite) and Lower Ordovician (Arbuckle group) rocks were deposited farther south-west as the seas encroached on this land mass.

Towards the end of early Ordovician time, the central part of south-eastern Colorado was raised above sea level and during middle and late Ordovician times sediments of the Simpson group and the Viola limestone were deposited. However, after Ordovician time, erosion removed most of the Cambrian and Ordovician rocks from that area.

It is supposed that in Mississippian time the seas advanced from the Anadarko basin, and during Meramec time covered the land mass entirely. In Chester time the seas appear to have been restricted to the Hugoton embayment in south-eastern Colorado.

From the beginning of Pennsylvanian time, through Morrow time, Missouri time, and early Permian time, the seas advanced in various areas described in this paper, until late Permian time, when the seas receded to leave a fairly stable shore line. E. N. T.

412. Gypsum-oolite dunes, Great Salt Lake desert, Utah. D. J. Jones. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2530.—A study was made of the eastern marine area of the Great Salt Lake desert near the village of Knolls, Tooele County, Utah, where a series of large lateral or transverse dunes occur.

These dunes, which are composed primarily of gypsum

crystals and cleavage fragments, oolites, with minor amounts of shell fragments and fine quartz, were derived from lake waters during the waning stages of Lake Bonneville in the area of the present Great Salt Lake desert.

Data are given of the size-frequency distribution, and photomicrographs demonstrate the lithologic distribution of the component minerals through the various size-fractions of the dune material. The dunes were also found to contain identifiable ostracods which are described and illustrated.

E. N. T.

413. Continental framework and petroleum exploration in western United States. W. W. Mallory. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2490.—Attention is called to the 3 major pre-Tertiary geologic provinces in the region under discussion, and an evaluation is made of them.

The western interior United States lies athwart parts of the North American Paleozoic–Mesozoic craton and the miogeosynclinal and eugeosynclinal belts of the Cordilleran orthogeosyncline. Tectonic activity during deposition in the eugeosynclinal belt plus strong orogeny afterwards contrasts markedly with contemporaneous cratonic quiet. The miogeosynclinal belt shares sedimentation and diastrophic aspects of the other 2 provinces.

The conclusion is stated that future petroleum reserves in the Paleozoic and Mesozoic rocks of this area do not exist in the Cordilleran eugeosynclinal belt and probably not in the miogeosynclinal belt either, but do lie in abundance on the craton.

E. N. T.

414. Australia determined to find oil. H. H. Raggatt. *Petrol. Engr*, July 1953, **25** (7), E5.—Surveys have been conducted in many parts of Australia.

In the Fitzroy river basin of West Australia surveys have revealed suitable structure at the surface, whilst between the Exmouth Gulf and Gascoyne River in the Northwest Basin area much geological and geophysical work has been done.

Parts of Southern Queensland, Victoria, and South Australia have also been surveyed either by government or private operators.

Increased prospecting and intensified search is forecast in Australia for 1953.

W. S. R.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

415. Limitations of reflection seismograph. L. E. Nugent, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2513.—A discussion is given of the factors determining the precision of data procured by the reflection seismograph.

The paper is presented under 3 main headings which are: instrumentation—errors caused by various components; computation—errors introduced by uphole and primary wave computational procedures, in connexion with various plotting methods; velocity—numerous vagaries and their potential errors are analysed.

The conclusion is reached that surveys which involve only errors of the first 2 categories may be accurate to + or − 50 ft, while those under the third may vitiate the results.

E. N. T.

DRILLING

416. The first results from a method of cutting a stuck drill pipe by explosives. L. Richard. *Bull. Ass. franç. Tech. Pétrol*, Jan. 1953, **31**, 13–30.—Formerly stuck drill pipe was cut off above the point of freezing by lowering a suitable cutter inside the drill pipe on "macaroni." Later in the U.S.A. backing-off at a tool joint was employed. In this torque was applied, and an explosive charge set off at the appropriate point. No details were available on this technique, and therefore S.N.P.L.M. undertook some studies, aided by S.P.E.

The explosion sets up violent transverse and longitudinal vibrations, loosening the threads in the tool joint and facilitating unscrewing. The explosive charge needed varies with the size of drilling pipe and with the mud pressure, and curves show the relationships between the pressure, pipe dia, and max amounts of explosive, expressed as g hexogene/m.

The point of freezing is determined as accurately as possible by extensiometry, and the apparent weight of the drill pipe above this point is calculated. Before introducing the explosive a couple is applied to the drill pipe. A table shows the couples which are suitable for different pipe sizes. The construction of the explosive charge and its insertion are described in detail. After insertion of the charge tension and torsion are applied to the drill pipe.

The results of applying this technique in a number of cases are briefly summarized in tabular form.

G. D. H.

417. The evolution of medium and heavy electrical drilling equipment. M. Magne. *Bull. Ass. franç. Tech. Pétrol*, March 1953, **31**, 39–53.—In some areas power may be obtained from the ordinary electric supply lines, or by special lines laid with a view to supplying other consumers, if possible, as well as the drilling equipment. Alternatively, a diesel electric unit may be used.

The electrical requirements and the nature and characteristics of a mobile transformer unit are described in some detail. A comparison of diesel electric and other electrical equipment costs is made.

G. D. H.

PRODUCTION

418. Properties of linear water floods. L. A. Rapoport and W. J. Leas. *J. Petrol. Tech.*, May 1953, **5** (5), *AIMME Tech. Paper No.* 3562, 139–48.—The Buckley-Leverett theory of the displacement of immiscible fluids has been extended to provide a more detailed formulation of water flood behaviour in horizontal linear systems. Consideration has been given to the evaluation of capillary pressure effects, and suitable differential equations have been derived. The theory indicates that the flooding behaviour depends on the length of the system and on the rate of injection, resolving some of the apparent contradictions of previous experimental work. Systems of different lengths give the same flooding behaviour if the injection rates and fluid visc are suitably "scaled." The sensitivity of the flooding behaviour with respect to rate and length decreases as any one of these factors increases in value, and the behaviour is independent of rate and length (*i.e.* stabilized) for sufficiently long systems or high rates of water injection. For stabilized systems Buckley and Leverett's theory applies.

Laboratory flooding test results agreed closely with the new theory. These are discussed, and it is concluded that under field conditions flooding is usually stabilized. A procedure is indicated for evaluating field performance by tests on cores or by calculations based on relative permeability data.

G. D. H.

419. Water flooding in North Government Wells field, Duval County, Texas. D. M. Collingwood and R. J. Bethancourt. *J. Petrol. Tech.*, June 1953, **5** (6), *AIMME Tech. Paper No.* 3582, 157–64.—A pilot water flood, with its minimum initial final risk, was undertaken on Sun Oil Co's L. Wiederkehr lease of the North Government Wells field. This lease covers 3085 acres and has production from 7 zones from 700 to 7500 ft deep. The North Government Wells sand at 2250 ft produces over 710 acres, and ranges 4–25 ft in thickness. It dips at about 33 ft/mile. Primary production was by solution gas and fluid expansion, with a limited water drive. Porosity averages 26%, connate water 30%. On the First Section, covering 100 acres, the first effects of the flood were noted 20 months after injection began. The Second Section with 80 acres showed positive effects after 10 months. This led to work on the Third Section, where favourable results were noted after 7 months.

The equipment and operating problems are described. The total cost to the beginning of 1953 was $69,651, or $0.024/brl of injected water. The First Section had produced 53,209 brl of extra oil, and it is estimated that the total water flood had given 151,300 brl of oil. G. D. H.

420. Corrosion and its control. F. R. Mulker. *J. Petrol. Tech.*, May 1953, **5** (5), 30.—Oil well corrosion is acidic attack on ferrous metals in wells, and is mainly due to H_2S and CO_2 in the presence of water. Wear and corrosion go hand in hand. Iron counts of produced water are a guide to corrosion, and control is often instituted when iron reaches 25 p.p.m.

Alloys have been used to combat corrosion, but stainless steel requires oxygen to be present to make it resistant. Alloys may accelerate corrosion in other metals. Corrosion inhibitors are common, and act by forming films of susceptible metals. Chemi-absorbed films are more persistent and wear-resistant than physically absorbed films. Both coat anodic and cathodic areas. Reactive film formers include chromates for anodic surfaces, and arsenicals for cathodic surfaces. The latter are not compatible with the HS ion.

The use of corrosion inhibitors has reduced production costs for some Californian producers by amounts up to 85%. G. D. H.

421. Use of the automatic free piston in oil well production problems. E. D. McMurray. *J. Petrol. Tech.*, June 1953, **5** (6), *AIMME Tech. Paper No.* 3583, 165–70.—The free piston has seamless monel bellows which can be charged to a suitable pressure, and which operate sleeve valves, and determine the position of the rubber packer. When elongated the packer allows fluid to pass between the packer and the tubing walls. At the base is a shock absorber to cushion the piston when it falls to the stop placed a little above the lowest gas-lift valve in the tubing. During the first few days of operation a steel burring tool can be used on the piston instead of the rubber packer. At the surface above the master valve is a flow tee and lubricator, with an automatic piston catcher and a shock absorber.

In use the packer is opened when a suitable head of liquid has collected above the piston. Timed with this build-up the surface controller admits injection gas to the operating gas-lift valve, and this opens, starting the piston and oil on their journey to the surface. There is no slippage of fluid, and little if any mingling of gas and fluid. The gas injection stops before the piston reaches the surface, and the piston drops back from the lubricator when the tubing pressure falls to a value which permits the packer to retract.

The piston reduces the injection ratio/brl of fluid, lower injected pressures can be used (100 p.s.i. can be used in a 10,000-ft well); emulsion is eliminated and paraffin scraped. The device can be used in some flowing wells (those stop-cocked), prolonging flowing life and reducing gas–oil ratios. G. D. H.

422. Skin effect and its influence on the productive capacity of a well. A. F. Van Everdingen. *J. Petrol. Tech.*, June 1953, **5** (6), *AIMME Tech. Paper No.* 3581, 171–6.—Analyses of pressure build-up curves show that the pressure drop near the well bore is greater than that computed from equations using the known physical characteristics of the formation and fluids. This skin effect is assumed due to reduced permeability at and near the well bore as a result of drilling, completion, and possibly production practices. Equations relating pressure and flow are derived which take note of this skin effect, and also of the storage capacity of the casing and tubing. Build-up curves are analysed to determine reservoir pressure, average permeability, and the skin factor. Field applications are discussed in relation to re-perforating and acidizing. G. D. H.

423. Water input profile determinations on injection wells in secondary recovery fields. B. Adamson and B. D. Brown. *J. Petrol. Tech.*, June 1953, **5** (6), 13–17.—The success of water flood secondary recovery projects may require a knowledge of the distribution of input water in injection wells. Thief formations, imperfect completions, and inadequate well data may all lead to flood water being diverted from the producing horizons.

Tests are described which have used the interface velocity procedure, coupled with caliper surveys to give satisfactory input profiles. The advance of the interface was detected electrically. A correlation curve for adjusting results to geological data is important, and it is of value to locate the casing seat with respect to the measurements. Under normal conditions the correlation between input profile data and permeability from cores was good.

The results of the tests on a number of wells are given. G. D. H.

424. Condensate production. J. A. Klotz. *J. Petrol. Tech.*, May 1953, **5** (5), 27–9.—The G.O.R. of condensate reservoirs is usually 10,000–50,000 cu. ft/brl. The condensate is colourless to straw-coloured, and 48° API or higher. As gas is produced and pressure declines the concentration of methane and ethane decreases and that of the heavier hydrocarbons rises. About 40% of the compounds heavier than butane may be lost by retrograde condensation in the reservoir. Recycling involves the separation of dry gas from condensable liquids, and its injection into the reservoir. This maintains pressure, reducing retrograde condensation, maintaining well rates, and also conserving gas.

Wide spacing increases overall sweep efficiency. Recovery depends on recycling pressure, but in practice economic as well as technical factors must be considered. Details of a study illustrating this point are given. G. D. H.

425. Vaporization of hydrocarbons from an unconsolidated sand. C. W. Oxford and R. L. Huntingdon. *J. Petrol. Tech.*, May 1953, **5** (5), 15–18.—Wilcox sand with a porosity of 32·8% and a permeability of 1 darcy was packed in a bomb, partially saturated with *n*-hexane, *n*-heptane, and condensate, and charged with nitrogen. The sand was preferentially water wet. After standing for 24 hr the gas was bled off at a desired rate and sampled. Alternatively, the sand partly charged with hydrocarbons was flushed with nitrogen. It was found that the presence of water or brine had little effect on the quantity of hydrocarbon vaporized. Withdrawal rate had little effect on vaporization under the conditions employed. In the constant pressure flushing the approach to equilibrium was a function of space velocity. G. D. H.

426. Ionic double-layer conductivity in reservoir rock. W. O. Winsauer and W. M. McCardell. *J. Petrol Tech.*, May 1953, **5** (5), *AIMME Tech. Paper No.* 5565, 129–34.—The resistivity factor of a normal rock is independent of the electrolyte resistivity and depends on the pore geometry. However, there are rocks in which the resistivity factor changes with the resistivity of the electrolyte. This variation occurs in shaly reservoir rocks, and is due to the electrical double layer in the soln adjacent to the charged clay surfaces. The higher conductivity arises from the higher concentration of ions in the double layer than in the soln in equilibrium with the double layer. Experiments which support this hypothesis are described, and it is also shown that the effect is also dependent on the type of ion in the soln. G. D. H.

427. Spraberry permeability from build-up curve analyses. A. B. Dyes and O. C. Johnstone. *J. Petrol. Tech.*, May 1953, **5** (5), *AIMME Tech. Paper No.* 3563, 135–8.—The effective permeability of the Upper Spraberry reservoir has been calculated by analysing the pressure build-up curves of 16 wells in the Driver area. The values range 2–18 mD, compared with 0·5 mD or less measured on the actual sandstone. The difference is due to the fracture system, and many of the fractures noted in cores are thought to be original. Fracture treatment of the wells is intended to improve the connexions between the wells and the natural fracture system. Well

productivity seems to depend mainly on the permeability of the natural fracture system, but can show a three-fold variation even for areas of equal permeability of this fracture system. This is a consequence of variations in the effectiveness of well fracture treatment. Some two-thirds of the wells show some degree of local blockage. G. D. H.

428. Calculations of unsteady-state gas flow through porous media. G. H. Bruce, D. W. Peaceman, H. H. Rachford, and J. D. Rice. *J. Petrol. Tech.*, March 1953, **5** (3), *AIMME Tech. Paper No.* 3518, 79–92.—Unsteady-state gas flow through a porous medium gives a second-order non-linear partial differential equation for which no analytical solution has been found. A stable numerical procedure is developed for solving this equation, and is used for calculating pressure distributions in both linear and radial flow systems, the gas being assumed to be ideal, the reservoir homogeneous, and the depletion rate constant. Finite difference approximations are applied in performing the integration. It was necessary to develop an implicit form of the difference equation to overcome the inherent error growth shortcomings of the more straightforward explicit formulæ. An electronic digital computer was employed, and the solutions are compared with the results of a laboratory investigation of gas depletion in a linear system, the agreement being within the experimental error. G. D. H.

429. Africa—a review of 1952 production. A. H. Chapman. *J. Petrol. Tech.*, March 1953, **5** (3), 31.—Average daily outputs in 1952 were Algeria 1000 brl, Egypt 45,700 brl, French Morocco 2100 brl. Exploratory drilling was carried out in Tunisia, Ethiopia, Nigeria, and Mozambique. There were surface surveys in East Africa and British Somaliland. G. D. H.

430. Far East—a review of 1952 production. E. W. Berlin. *J. Petrol. Tech.*, March 1953, **5** (3), 29–30.—The 1952 outputs were: Mid-Sumatra 6,012,000 brl, South Sumatra 43,920,000 brl, Java 5,490,000 brl, East Borneo 5,856,000 brl, British Borneo 38,430, brl, Netherlands New Guinea 1,725,000 brl, Japan 2,159,400 brl. Daily outputs are estimated as follows: Formosa 270 b.d. (mostly dist), India 5600 b.d., Pakistan 250 b.d., and Burma 2300 b.d. 4 exploratory wells were successful in Sumatra, and one in Pakistan, near Dhulian. G. D. H.

OILFIELD DEVELOPMENT

431. North Dakota: new oil state. S. H. Harris. *Petrol. Engr*, July 1953, **25** (7), B7.—Oil was discovered in North Dakota in April 1951, production steadily increasing until the state is now ranked 17th in the U.S.A.

North Dakota was for much of geological time a portion of the huge sedimentary trough known as the Williston Basin. The synclinal axis of the trough was situated in the western part of the state. There are several recorded surface structures, whilst geophysical work has shown several other anomalies, much of the surface being covered by glacial drift. The Nesson Anticline, mapped as a surface feature, has proved to be a prolific trap.

Stratigraphy of the area has been correlated with that of neighbouring states, where there are important reservoirs in formations of similar age. The stratigraphy is described in detail.

There are now 8 oil pools with 160 producing wells occurring in 2 distinct areas. These are the Nesson trend in the centre and the Bottineau County trend on the basin's eastern flank. Production comes from the Mission Canyon (Mississippian) and Charles (Mississippian).

Much exploratory drilling is expected in 1953, especially in the Western region. Exploratory costs are high due to lack of oilfield supplies, cold weather protection, truckage charges, and completion practices for limestone reservoirs. W. S. R.

432. Present development of Mexican oil industry. E. Zubryn. *Petrol. Engr*, July 1953, **25** (7), B62.—The Ezequiel Ordonez field discovered in 1952 was found to be an extension of the old Cerro Azul field. There are now 9 wells producing 36,000 b.d. 21° API oil from "Tanabra" limestone. Some 30 to 40 more wells are planned but if the field extends to the sea this figure will be increased.

During 1952 307 wells were drilled, proven reserves being raised to 2·2 billion brl. Shortage of materials has hampered the exploration and drilling programme. W. S. R.

TRANSPORT AND STORAGE

433. Two oil pipelines in Schleswig-Holstein. K. Horn. *Erdöl u. Kohle*, 1953, **6**, 629–31.—Detailed illustrated description of double 32-km line from cracking plant at Hemmingstedt to North Sea–Baltic canal port at Brunsbüttelkoog. Crude (Middle East, 1·6/3·4° E/20° C) supplied through 6 inch line (450,000 tons/year), gasoline delivered through 5 inch (400,000 tons/year). Both lines laid underground (1 m), of seamless tubing, and welded. Reciprocating pump (30–60 atm) for crude, rotary for gasoline. V. B.

434. How to select motors and controls for pipeline pumping stations. R. J. Osborn. *Oil Gas J.*, 14.12.53, **52** (32), 111.—Equipments for large dia trunk-line stations using motors of 800 h.p. and over, smaller stations using between 200 and 500 h.p., and others using up to 200 h.p. are discussed. Horsepower, speed, voltage, motor, and enclosure are among factors to be considered in selection, and conditions at station will have an influence. Fire protection must be taken into account, and metal-clad switchgear used to provide a high degree of safety. G. A. C.

435. Tanker building outpaces increase in need. J. J. Winterbottom. *Oil Gas J.*, 21.12.53, **52** (33), 226.—Tables show estimated worldwide tanks requirements and tonnage equivalent T-2 tankers under construction and delivered, and world tanker tonnage by ages as at October 1953 (6000 dwt tons and over). G. A. C.

436. A ship to carry liquefied gas. Anon. *Mot. Ship.*, Nov. 1953, **34** (404), 333.—A short description is given of the *Rasmus Tholstrup* recently completed by Marstrands Mek. Verk., Marstrand, Sweden, for A/S Kosengas of Copenhagen and designed for carrying 320 tons of butane and propane gas in 12 containers housed on the tank top. U. M.

437. Tank heating coils—a survey. Anon. *Mot. Ship*, Nov. 1953, **34** (404), 340.—Rapid progress has been made in the design and adoption of corrosion-resisting coils and materials since the introduction of a new type of cast iron tank heating coil installed in an Anglo-Saxon Petroleum Co tanker reported in 1951. Swedish development as well as British is reported here. U. M.

438. Laundry for pipeline gas. R. C. Baird. *Oil Gas J.*, 4.1.54, **52** (35), 78.—To clean pipelines efficiently, cleaning equipment should be placed at some 10 different locations between well and consumer. A typical scrubber is described, operator requirements stated, and improvements in scrubber design outlined. A new gas sampler is shown, and method of operation given. G. A. C.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

439. Shell's Stanlow plant boasts many "firsts." Anon. *Oil Gas J.*, 21.12.53, **52** (33), 190.—A brief description and history of the growth are given of Stanlow refinery, Cheshire. The first cat cracker, sulphur recovery, hydrodesulphurization, and platforming plants in the U.K. were erected at Stanlow. G. A. C.

440. Inspection of refinery vessels. E. L. Weiss. *Oil Gas J.*, 14.12.53, **52** (32), 108.—Inspection practices to note deterioration in towers, drums, exchangers, and heaters are discussed. Frequency of inspection can be deduced, and an idea gained of rate of corrosion. Piping inspection should be carried out annually to obtain a corrosion trend. A chart enables retiring thickness for seamless steel pipe to be estimated. G. A. C.

441. When and where to use air-cooled heat exchangers. J. M. Whalen. *Petrol. Process.*, 1953, **8** (10), 1528–31.—The air-cooled heat exchanger is a simple device mechanically. It consists of an extended heat transfer coil, and a fan, mounted on a framework. One or more fluids flow through the coils as the fan either forces or draws air through them to effect the heat transfer. 6 factors are reviewed that may influence the choice of air-cooled exchangers over the more conventional fluid coolers. A table of estimated costs of fluid cooler units for petroleum processing applications is also presented. J. W. H.

442. Calculating cooling tower performance from test data (actual *vs* predicted). F. B. Read and L. T. Hart. *Oil Gas J.*, 9.11.53, **52** (27), 98.—Tables are provided whereby tower test data can be used to determine whether or not the tower is performing reasonably close to specified conditions, and to check the performance at other than design atmospheric wet bulb temp. G. A. C.

443. Patents. U.S.P. 2,637,333 (9.9.48; 5.5.53). W. L. Houston and M. F. Rawlings, assrs to Phillips Petroleum Co. Emergency valve.

U.S.P. 2,638,111 (11.10.49; 12.5.53). B. Wagner, assr to Gulf Oil Corpn. Float valve.

U.S.P. 2,638,328 (1.6.49; 12.5.53). W. K. Lewis, assr to Standard Oil Development Co. Method of heating fluids.

U.S.P. 2,638,665 (23.10.50; 19.5.53). P. S. Viles, assr to Standard Oil Development Co. 0·25–25% wt of sulphur is added to a conventional welding flux for welding chrome-nickel stainless steel.

U.S.P. 2,638,892 (22.12.47; 19.5.53). D. V. Hammond, T. R. Shaw, and G. O. Miller, assrs to Phillips Petroleum Co. Furnace damper control.

U.S.P. 2,638,925 (23.3.49; 19.5.53). T. P. Monahan, assr to Utah Oil Refining Co. Helical spring valve for combustion control.

U.S.P. 2,639,127 (30.11.50; 19.5.53). H. M. Becnel, assr to Standard Oil Development Co. Return bend for fired coils.

U.S.P. 2,639,129 (31.1.51; 19.5.53). A. J. de Rosset, assr to Universal Oil Products Co. Gas–liq mixing apparatus.

U.S.P. 2,639,224 (31.8.50; 19.5.53). J. McAfee, assr to Gulf Oil Corpn. Cat reactor.

U.S.P. 2,639,362 (23.10.50; 19.5.53). P. S. Viles, assr to Standard Oil Development Co. Article for welding stainless steels comprising a welding rod of nickel, chromium, and iron having a coating of a welding flux and sulphur.

U.S.P. 2,639,611 (7.12.48; 26.5.53). I. W. Alcorn, assr to Pure Oil Co. Dead wt tank for testing the bearing value of a column.

U.S.P. 2,639,822 (22.4.49; 26.5.53). H. V. Sax and H. V. Dressler, assrs to Shell Development Co. Pneumatic lifting and rotating machine for use, for example, for liq gas bottles.

U.S.P. 2,639,973 (16.12.50; 26.5.53). R. J. Fritz, assr to Standard Oil Development Co. Apparatus for improving gas distribution in bubble-cap tower operating on fluidized solids. J. M. S.

DISTILLATION

444. Use of wire-mesh sections in asphalt entrainment control in vacuum pipe stills—3. G. H. Gaumer and H. J. Oberling. *Oil Gas J.*, 28.12.53, **52** (34), 70.—Case history of the Tide Water Associated Oil Co's refinery at Avon, California, is presented. Improvements obtained after installing mesh sections in 2 vacuum towers are reported. To conclude the series the case history of Ainora Gasoline Co, Detroit, is given. G. A. C.

445. To help you design fractionators. Pt 8. Distillation of quaternary mixtures. R. R. White. *Petrol. Process.*, 1953, **8** (10), 1533–6.—This article considers the cases in which the separations in quaternary mixtures are so specified that some of the components disappear in the calculation of infinite stage columns. In order to discuss fully the application of this method of specification of the quaternary mixture, an illustrative example is presented. J. W. H.

446. To help you design fractionators. Pt 9. Distillation of quaternary mixtures. R. R. White. *Petrol. Process.*, 1953, **8** (11), 1705–7.—The last of this series deals with the principles developed in the preceding articles, and applies them to other methods of specifying quaternary separations which also result in the disappearance of components from the products at minimum reflux. As on previous occasions an example is given illustrating these principles. J. W. H.

CRACKING

447. First cat cracker in New England. Anon. *Petrol. Process.*, 1953, **8** (11), 1689–91.—The new 24,000-b.d. fluid cat cracking unit at Esso's Mass., U.S., refinery was designed for the optimum in investment and maintenance costs. There are 6 new features in this unit of interest to the refiner, the major ones are, the elimination of slide valves in the unit, only one expansion joint, and a 30% reduction in steel over the earlier designs. A table is given showing complete design data in the cat cracking section. The gasoline quality of the product is given as 94·1 O.N. J. W. H.

448. How conversion level affects product distribution. J. W. Moorman. *Oil Gas J.*, 4.1.54, **52** (35), 76.—Extent of conversion is the first of variables influencing cat cracker performance. Relationships showing effect of extent of conversion on yields are presented. G. A. C.

449. Sinclair's "cat" reforming process. J. W. Teter, B. T. Borgerson, and L. H. Beckberger. *Petrol. Process.*, 1953, **8** (10), 1519–23.—The new Sinclair-Baker cat, "Rd-150," can give the refiner the advantage of a more flexible and economic cat reforming operation. This new cat has been incorporated in the design and construction of a 16,000-b.d. cat reformer by the Sinclair Refining Co.

Details of reformate yields, octane numbers, and wt % of light gases produced from four crude sources of given feed stock characteristics are given at the press of operation. In addition, figures are listed for the aromatics production, and an analysis is presented of the operating costs. J. W. H.

450. How to test cement for erosion resistance. A. J. van Riemsdijk and H. W. van der Hoeven. *Petrol. Process.*, 1953, **8** (10), 1514–18.—Work carried out at the Koninklijke-

Shell–Laboratorium on the testing of erosion resistant cements as lining materials for cat cracking units is reviewed. Among the factors governing the choice of material, in addition to erosion resistance, are dimensional stability during drying and firing, blistering tendency, ease of application, and possibility of repair. Various test methods are described, and the most suitable recommended for use. J. W. H.

451. Cracking of *iso*propyl-, propyl-, *iso*butyl-, and *iso*amyl-benzenes. M. S. Malinovskii and Ya. I. Stoyanovskaya. *Zhur. Priklad. Khim.*, 1953, **26**, 420–5.—Experiments (350°–500° C) on cracking of alkyl-benzenes in presence of ethylene oxide; cracking commences at 350° C, whereas in absence thereof no cracking occurs at 430°–450° C. Ratio of C_2H_4O to alkyl-benzene was 1/0·5–2, max decomp occurring at approx 1–1 ratio. Propyl-, *iso*butyl-, and *iso*amyl-benzene yielded (at 400°–500° C) toluene (29% max) and benzene (17·5% max) whereas *iso*propyl-benzene gave only benzene (44% max). Minimum unreacted alkyl-benzene was 26·6%; in all cases appreciable quantities (3–40%) aldehyde fraction (20°–30° C) were formed. V. B.

452. Orthoflow fluid cracking process. H. P. Wickham and H. K. Kamptner. *Erdöl u. Kohle*, 1953, **6**, 624–8.—In Orthoflow process reactor is mounted above regenerator, thus same foundations serve both. Feed is vac dist, regenerator temp is 590°–610° C, and spent regenerator gases used for steam raising. Flow sheet and description given of unit erected for Scholven-Chemie at Gelsenkirchen-Buer. Details of constructional materials and in particular of design (with diagram) of valves for controlling cat circulation. Start-up and shut-down procedure described. Main claims for Orthoflow process are absence of erosion, due to short straight cat lines, and reduced down-time as compared to other types. V. B.

453. Thermal and catalytic cracking of paraffin hydrocarbons at high pressures. M. G. Gonikberg, A. E. Gavrilova, and B. A. Kazanskii. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **89**, 483–6.—Tests (3 hr) at 100–3100 atm with and without H_2, temp 415°–430° C, cat used Al silicate, charge *n*-hexane and *n*-heptane. Increased pressure decreases thermal cracking but increases cat cracking, in latter case there is increased isomer formation as compared with thermal cracking. Low (*ca* 350 atm) H_2 pressure inhibits thermal cracking, whilst high H_2 pressure accelerates both thermal and cat cracking. V. B.

454. Patents. U.S.P. 2,644,744 (26.2.51; 7.7.53). K. T. Hartwig and C. H. Watkins, assrs to Universal Oil Products Co. Reactor for high temp cracking.

U.S.P. 2,644,785 (3.6.50; 7.7.53). C. T. Harding, M. W. Mayer, and R. O. Wright, assrs to Standard Oil Development Co. Crude oil is dist to form a gas oil fraction (A), a naphtha cut (B), and reduced crude (C). B is subjected to cat reforming under reforming conditions yielding hydrogen which is used to strip C. A is cat cracked and the stripped C is further stripped with the cracked vapours, at a lower pressure than the first stripping, in a fractionation zone from which dist fractions are obtained.

U.S.P. 2,644,800 (1.6.49; 7.7.53). H. O. Mottern and W. N. Philo, assrs to Standard Oil Development Co. Shaped cat for a packed cat reactor, comprising a metal support element A up to 3 inches long having an elongated cyl body portion having an outside dia of $\frac{1}{4}$–$\frac{3}{4}$ inch and a number of annular flanges concentric with the body portion, and a solid cat deposited on A, completely filling the pockets between the flanges and forming a cat surface coating on A.

U.S.P. 2,645,562 (G.B. 10.1.47; 14.7.53). J. N. Haresnape and S. Hesling, assrs to Anglo-Iranian Oil Co. Gaseous pet fractions rich in hydrogen are obtained by cracking a pet fraction containing no material boiling below the gas oil range, in the presence of a montmorillonite clay which has been heated to 500°–700° C.

U.S.P. 2,645,604 (7.9.49; 14.7.53). A. Clark, assr to Phillips Petroleum Co. Naphtha is hydroformed by contacting it at 950°–1050° F and under a pressure of 200–250 p.s.i.g. with a chromia–alumina cat and contacting the effluent with a molybdenum oxide–alumina cat under hydroforming conditions. The temp in the second stage is 850°–930° F, the pressure being the same as in the first stage.

U.S.P. 2,645,605 (27.4.51; 14.7.53). W. H. Long and C. L. Gutzeit, assrs to Socony-Vacuum Oil Co. Naphtha is reformed by contacting with a cat comprising 5–70% wt of chromium oxide, 0·1–2·0% wt of fluorine, half to twice the amount of tin, antimony, or bismuth necessary to form the normal fluoride of the metal in its lower valency and the balance alumina. The process is carried out at 900°–1050° F, at a pressure between 100 and 750 p.s.i.g., at a liq hourly space velocity between 0·5 and 5 and in the presence of 1–10 mol hydrogen per mol of naphtha.

U.S.P. 2,645,606 (31.5.49; 14.7.53). H. J. Hepp, assr to Phillips Petroleum Co. Pebble heat exchange conversion process for hydrocarbons.

U.S.P. 2,645,673 (8.12.45; 14.7.53). R. L. Hasche, assr to Eastman Kodak Co. Production of acetylene by pyrolysis of hydrocarbons.

U.S.P. 2,646,391 (25.10.47; 21.7.53). E. J. Houdry, assr to Houdry Process Corpn. Cracking hydrocarbons in a plurality of annular cracking zones containing beds of static cat.

U.S.P. 2,646,407 (30.4.48; 21.7.53). R. C. Lassiat and R. T. Savage, assrs to Houdry Process Corpn. Method of introducing fluent solid particles into a contacting zone.

U.S.P. 2,647,041 (15.4.46; 28.7.53). S. P. Robinson, assr to Phillips Petroleum Co. Cracking hydrocarbons to hydrogen and carbon by contact with a counter-current stream of hot pebbles made of iron, nickel, chromium, or copper. The pebbles are heated by contact with water gas and blue gas devoid of free oxygen.

U.S.P. 2,647,042 (23.7.46; 28.7.53). G. A. Mills, assr to Houdry Process Corpn. Hydrocarbons are converted in the presence of a refractory inorganic contact mass (A) with deposition of carbonaceous material (B) on A, and A is subsequently heated in a non-oxidizing atm at 1200°–1800° F to decompose B with evolution of hydrogen.

U.S.P. 2,647,044 (26.3.49; 28.7.53). R. T. Savage and J. C. Dart, assrs to Houdry Process Corpn. Solids baffle for cat apparatus.

U.S.P. 2,647,075 (G.B. 10.1.47; 28.7.53). J. N. Haresnape and F. W. B. Porter, assrs to Anglo-Iranian Oil Co. Pet feedstock boiling in the gas oil range or higher is treated with hydrogen in the presence of a sulphur-resistant hydrogenation cat to convert sulphur present in the feedstock to H_2S, the H_2S is separated and the desulphurized feedstock is cracked in the presence of a montmorillonite clay which has been heated to 500°–700° C to remove combined hydroxyl groups. A gas rich in hydrogen is separated from the cracked products, and this gas used in the desulphurization step.

U.S.P. 2,647,076 (G.B. 10.1.47; 28.7.53). J. N. Haresnape and F. W. B. Porter, assrs to Anglo-Iranian Oil Co. Sulphur-containing pet feedstock is cracked in the presence of a montmorillonite clay which has been heated to 500°–700° C to remove combined hydroxyl groups, the cracked products are separated into a liq fraction (A) and a hydrogen-containing gas (B), A and B are passed over a sulphur-resistant hydrogenation cat to hydrogenate olefins and sulphur compounds present in A, and the products are separated into a gaseous fraction and a desulphurized liq fraction. J. M. S.

HYDROGENATION

455. Additivity of the thermodynamic potential in homologous series of hydrocarbons. J. J. Stoggerda. *Ingenieur, 's Grav*, 18.12.53, **65** (51), 117–20.—Apart from a small initial effect, the thermodynamic potential in a homologous series of *n*-paraffins

or *n*-1-olefins is a linear function of the number of C-atoms, as both enthalpy and entropy have a constant increment per CH_2 group. Hence it is possible to derive simple formulæ for equilibrium calculations in hydrogenation, alkylation, and polymerization reactions. G. F. T. C.

456. Sulphur removal by hydrogenation. P. W. Sherwood. *Erdöl u. Kohle*, 1953, **6**, 616–19.—Availability of cheap H_2 from reforming processes, use of high S crudes, and requirement of low S in products combine to make hydrogenation removal of S attractive. Shell liq phase hydrodesulphurization process using cat of 0·8 pts Co, 6·5 pts Mo, on 100 pts bauxite carrier operates exothermically at 360° C and 50 atm, optimum H_2 is approx 100 m³/brl. Cat has long life, and can tolerate approx 10% CH_4 in H_2. Vapour phase Shell process employs W–NiS cat at somewhat higher H_2–oil ratio. Cat regeneration (> 680° C) is necessary, but can be temporarily postponed by temp increase and reduction of space velocity. Cracking of S-reduced oils can yield gasolines not requiring further refining. Processes are applicable to shale oils, where reduction of olefins and elimination of N is of special importance. V. B.

457. Patent. U.S.P. 2,646,394 (27.12.50; 21.7.53). R. V. Green and E. P. Jensen, assrs to E. I. du Pont de Nemours and Co. Long chain aliphatic alcohols are made by hydrogenating long chain aliphatic acids or their esters in presence of a metal hydrogenation cat, separating the cat by filtration, precipitating dissolved metal from the product, and recovering the alcohols by dist. J. M. S.

POLYMERIZATION

458. Patents. U.S.P. 2,644,798 (26.6.48; 7.7.53). J. D. Calfee and C. A. Kraus, assrs to Standard Oil Development Co. Polymerization cat consisting of a hydroxylated aluminium halide having a mol ratio of halide to aluminium between 2 : 1 and 2·8 : 1, in soln in an alkyl halide of 1–3 carbon atoms, carbon disulphide, or an aliphatic hydrocarbon of 2–4 carbon atoms.

U.S.P. 2,644,809 (11.1.50; 7.7.53). J. S. Saylor, assr to Standard Oil Development Co. A mixture of a mono-olefin of 4–8 carbon atoms and a multi-olefin of 4–14 carbon atoms is polymerized in the presence of a Friedel–Crafts cat and dichlorodifluoromethane, trichloromonofluoromethane, dichloromonofluoromethane, or dichlorotetrafluoroethane, at a temp between −20° C and the fl. pt. of the solvent.

U.S.P. 2,465,631 (16.2.48; 14.7.53). W. W. Crouch and E. W. Cotten, assrs to Phillips Petroleum Co. Emulsion copolymerization of SO_2 and unsaturated organic compounds.

U.S.P. 2,645,649 (30.11.50; 14.7.53). A. E. Hoffman, assrs to Universal Oil Products Co. Drying oils are made by copolymerizing a mono-olefin and a conjugated di-olefin in the presence of hydrogen fluoride cat, separating the cat, mixing the copolymer with a polyhydric alcohol and heating at 50°–250° C.

U.S.P. 2,646,425 (23.3.51; 21.7.53). A. W. Barry, assr to E. I. du Pont de Nemours and Co. Ethylene (A) is polymerized under pressures between 50 and 3000 atm at temp up to 400° C in the presence of water and a free radical producing cat, the water separated from the reaction mixture at the pressure and temp of the polymerization and unreacted A separated from the polymer at a pressure and temp sufficient to maintain the polymer molten.

U.S.P. 2,647,107 (G.B. 8.4.49; 28.7.53). A. W. Barnes, assr to I.C.I. Ltd. Polymerization of vinyl chloride in the presence of a peroxy, azo, or persulphate polymerization cat and iodoform.

U.S.P. 2,647,109 (27.2.50; 28.7.53). I. M. Kolthoff and A. I. Medalia, assrs to Phillips Petroleum Co. Emulsion polymerization of conjugated dienes in the presence of an organic hydroperoxide, a water-sol iron salt, a water-sol pyrophosphate, and a reducing composition made by treating a sugar with hydrogen peroxide in the presence of a water-sol ferrous salt. J. M. S.

ALKYLATION

459. Alkylation of benzene by propylene in the presence of poly*iso*propylbenzene and aluminium chloride. A. V. Topchiev, Ya. M. Paushkin, and M. V. Kurashev. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **88**, 849–52.—Addition of poly*iso*propyl benzene (mixture of *o*-, *m*-, and *p*-di-*iso*propylbenzenes) shifts reaction equilibrium towards larger yield of *iso*propylbenzene and minimizes formation of poly*iso*propylbenzene. In all experiments 15% (on reacting mass) $AlCl_3$ was used. Addition of poly*iso*propylbenzene enables alkylation of C_6H_6 by C_3H_8 to be performed with negligible formation of fresh poly*iso*propylbenzene. At $C_3H_8 : C_6H_6$ ratio of 1 : 2 substitution of ½ mol C_6H_6 by equivalent wt of poly*iso*propylbenzene raised yield of alkylate (b.p. 120°–170° C) from 70 to 90%. V. B.

460. Catalytic alkylation of benzene by ethyl and propyl alcohols. M. B. Turova-Polyak *et al. Doklad. Akad. Nauk S.S.S.R.*, 1953, **89**, 495–8.—Using Al silicate cat, atm pressure, optimum temp for production of ethylbenzene was 450° C. At mol ratio benzene–alc 3–1 yield (on alc) of ethylbenzene decreased with increasing space velocity (28% at 0·03, 15% at 0·66). For production of *iso*propylbenzene optimum conditions (using both *n*- and *iso*-propyl alc at 4–1 benzene–alc ratio) were 325° C and space velocity 0·66. Yields were 49 and 54% respectively. It is considered that reaction proceeds by way of dehydration of alc and reaction of resultant olefin with the benzene; this is supported by production of *iso*propylbenzene on alkylation with *n*-propyl alc. Olefins in gas issuing from benzene–alc reaction can be used to make additional alkylate. V. B.

461. Alkylation of *cyclo*paraffins by olefins. Yu. G. Mamedaliev and A. Kuliev. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **88**, 471–3.—Methyl*cyclo*hexane (95–98%) was reacted with propylene (77%)–propane (7%) fraction from cracking-gas at 1 : 1 mol ratio, 33° C, with 98% H_2SO_4 as cat. Reaction product contained 55% unchanged methyl*cyclo*hexane, 15% residue, and 30% methyl*iso*propyl*cyclo*hexane, which dehydrogenation analysis showed to be mainly hexahydrocumene. V. B.

462. Patents. U.S.P. 2,644,843 (30.12.49; 7.7.53). F. S. Crossley, assr to Merck and Co. Arylmethyl methyl ketones are alkylated by heating them with an alkyl halide, dialkyl sulphate, or alkyl arylsulphonate in the presence of sodium or potassium hydroxide.

U.S.P. 2,645,601 (22.6.49; 14.7.53). F. E. Frey, assr to Phillips Petroleum Co. The pour point of paraffinic material is lowered by treating it with a low boiling saturated hydrocarbon and aluminium bromide at 10°–100° C.

U.S.P. 2,645,672 (2.8.48; 14.7.53). W. A. Schulze, assr to Phillips Petroleum Co. High mol. wt. alkyl benzenes are made by cracking a petroleum fraction boiling above 400° F, isolating a fraction containing aromatic hydrocarbons and olefins, mixing this fraction with a low boiling olefin, contacting the mixture with a silica–alumina cat to form an alkylate, separating the alkylate from unreacted olefins, and using these to alkylate benzene in the presence of liq HF.

U.S.P. 2,646,452 (20.5.49; 21.7.53). L. Schmerling, assr to Universal Oil Products Co. Alkylating hydrocarbons in the presence of a cat made by reacting 1 mol of a phosphorus oxyhalide with 1–2 mol of anhyd aluminium chloride or bromide at −30° to 150° C. J. M. S.

ISOMERIZATION

463. Patents. U.S.P. 2,644,847 (29.9.48; 7.7.53). H. S. Bloch and A. E. Hoffman, assrs to Universal Oil Products Co. Hydrocarbon drying oils recovered from a polymerization sludge and which are a mixture of polyolefinic cyclic hydrocarbons having diene numbers of at least 80, are isomerized

in the presence of an amount of a conjunct polymerization cat less than that theoretically required to form cat–hydrocarbon complexes, until the diene number has been reduced to 15–65.

U.S.P. 2,645,670 (26.10.50; 14.7.53). H. Pines and V. N. Ipatieff, assrs to Universal Oil Products Co. 1 : 2 : 3 : 4-tetramethylbenzene is produced by reacting pinane at 250°–425° C in the presence of a platinum cat and a hydrogen or alkyl halide.

U.S.P. 2,646,453 (30.6.49; 21.7.53). F. E. Condon, assr to Phillips Petroleum Co. Use of methyl*cyclo*pentane in 2 : 2 : 4-trimethylpentane isomerization. J. M. S.

SPECIAL PROCESSES

464. Synthetic phenol manufacture. Pt 2.—The regenerative (Raschig) process. P. W. Sherwood. *Petrol. Process.*, 1953, **8** (10), 1543–5.—The synthesis of phenol by this route involves 2 chemical steps: the chlorination of benzene by hydrogen chloride in the presence of air, followed by steam hydrolysis of monochlorobenzene. Hydrogen chloride evolved in the second stage is recovered and recycled to the chlorination stage. Except for losses in the process, benzene is the only raw material. Operation conditions for these 2 reactions are given, together with the % of product formation in the form of monochlorobenzene. A comprehensive flow sheet is also presented showing the hydrogen chloride recycle. J. W. H.

465. Synthetic phenol manufacture. Pt 3.—Sulphonation and chlorination. P. W. Sherwood. *Petrol. Process.*, 1953, **8** (11), 1722–8.—The sulphonation process for the manufacture of phenol has been used since the beginning of the century, and is used for production on a relatively small scale. The first step in the process is the sulphonation of benzene. The addition of sodium sulphite brings about partial neutralization to sodium benzene sulphonate. When pure caustic soda is fused into the sulphonate consequent hydrolysis takes place and sodium phenate is formed. Acidification with sulphurous, carbonic, or sulphuric acids yields free phenol.

The direct chlorination method for the production of phenol is most widely used where phenol is manufactured on a large scale. Benzene is chlorinated in the presence of ferric chloride. The resulting monochlorobenzene is converted into sodium phenolate by the addition of caustic—the phenolate is then acidified to phenol.

Both these methods of phenol manufacture are discussed in detail, and a complete flow sheet is given for the sulphonation process. J. W. H.

466. "De-bug" your sulphur plant boiler. S. Schwartz. *Petrol Process.*, 1953, **8** (11), 1713–15.—Heat transfer problems and tube failures can be avoided by knowing the thermal properties of sulphur. Difficulties have been prevalent in plants erected and in service since 1944, and many of these have had boiler troubles. In these plants, for the recovery of sulphur from petroleum-produced hydrogen sulphide, the foremost problems encountered were related to the removal of heat.

In all sulphur recovery operations difficulties will arise: the plant may "freeze" or "burn" up if the boiler unit has been designed on an incomplete knowledge of the thermal data involving elemental sulphur vapour and a lack of experience of hydrogen sulphide combustion and combustion products.

This article shows how such difficulties can be overcome by an adequate knowlegde of these factors. J. W. H.

467. After-filters remove wax "haze." D. P. Thornton, ed. *Petrol. Process.*, 1953, **8** (11), 1697–9.—The installation of special cartridge type after-filters at Cit-Con Oil Co, Lake Charles, La., U.S., refinery, has solved the problem of removing minute quantities of wax from unblended lub oil base stocks. This faint "haze" visible at room temp was not detected by the ASTM tests, but nevertheless its removal was necessary. A total of 1256 filter elements are used stacked 4 high in 314 assemblies. This equipment is enclosed in cylindrical vessels 61½ inches O.D. by 87½ inches high. 3 of these units are employed for the "haze" removal. J. W. H.

468. Hydrazine at Lake Charles. D. P. Thornton, ed. *Petrol. Process.*, 1953, **8** (10), 1540–1.—Hydrazine, known since late in the second world war for its value as a propellant in rockets, is now produced on a large scale at a new commercial plant at Lake Charles, La., U.S. A modification of the Raschig synthesis, developed in 1907, which oxidizes ammonia with sodium hypochlorite to form hydrazine, water, and sodium chloride, is used. No information of the modifications employed on this new plant are given. J. W. H.

METERING AND CONTROL

469. Electronic control in petroleum processing. W. T. Marchant. *Oil Gas J.*, 9.11.53, **52** (27), 124.—The use is described of a current transmitting system in equipment employed in England by Anglo-Iranian Oil Co in refinery application. The control system, solvent-extraction unit, re-run, and other units are dealt with.

Figures show principle of operation in various cases. G. A. C.

PRODUCTS

CHEMISTRY AND PHYSICS

470. Conditions for the stable burning of carbon in an air stream. D. B. Spalding. *J. Inst. Fuel*, Dec. 1953, **26** (155), 289.—The rate of heat loss from a carbon surface is related to the mass transfer rate and to the rate of chemical reaction; this is discussed fully for the case of combustion of carbon to carbon monoxide. The conclusion is drawn that the range of stable burning is limited: the lower limit when non-convective heat losses prevent maintenance of an adequate surface temperature, and the upper limit, which is present even when there are no non-convective heat losses. The limits can overlap under certain conditions, then no stable burning is possible. The ignition process is considered, and a method suggested for calculating the case of simultaneous formation of carbon monoxide and carbon dioxide. D. K.

471. The structure and stability of flat burner flame. B. H. Holland. *J. Inst. Fuel.*, Dec. 1953, **26** (155), 282.—Lit and unlit streams of ethylene have been examined when leaving the burners by the technique of spark shadow photography. Points of flame instability were correlated with the changing structure of the gas stream.

It was shown that burner design is the main factor governing flame stability. During the investigation described the twin-hole type burner was most successful. D. K.

472. Synthesis of 1-C^{14} pentane and 3-C^{14} pentane. A. F. Lukovnikov *et al. Doklad. Akad. Nauk S.S.S.R.*, 1953, **88**, 297–300.—Detailed description of procedure. Pentanes made from $C^{14}O_2$ via *n*-butyl MgBr and EtMgI respectively, yields being 85 and 82%. Measurement of sample activity showed that for 1-C^{14} pentane 43% of radio carbon present in original $BaC^{14}O_3$ was utilized, and 30% in case of 3-C^{14} pentane. V. B.

473. Decomposition of olefinic hydrocarbons in the presence of alumino-silicate catalyst. A. A. Petrov. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **90**, 195–8.—Tests on low temp (250° C) decomp of trimethylpentenes, trimethylhexene, tri*iso*butylene, and dimethylhexene over synthetic cat show that decomp is

favoured by presence of 2 or more alkyl side chains in β position relative to each other, ease of decomp increases with no. of such groups. V. B.

474. Kinetics and mechanism of decomposition of paraffin hydrocarbons in presence of certain inhibitors. A. D. Stepukhovich. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **90**, 213–16.—Effect of addition of *iso*butylene and propylene on decomp of propane, *iso*butane, and butane at 10 mm and 548°–620° C was examined. *iso*Butylene was more effective than propylene, inhibitory action decreases with increasing temp. Reaction mechanism is discussed and constants calc, inhibitory action is probably due to separation of H atom from the olefin mol; this explains known absence of inhibiting effect with ethylene. V. B.

475. Temperature dependence of the free energy, equilibrium constant, and heat of formation of *n*-alkyne vapours. P. G. Maslov. *Zhur. Priklad. Khim.*, 1953, **26**, 388–92.—Expression has been derived for calc free energy of formation of *n*-alkyne vapours from their elements in temp range $250° \leqslant T° \leqslant 1600°$ K. Such values, and likewise log equilibrium const of such formation, are tabulated for C_3–C_{20} compounds at 7 temp. Data are in good agreement with experimental values and those obtained spectroscopically. V. B.

476. Temperature dependence of the free energy, equilibrium constant, and heat of formation from their elements, for the vapours of *n*-alkyl-benzenes. P. G. Maslov. *Zhur. Priklad. Khim.*, 1953, **26**, 543–6.—Continuation of the previous work (see preceding abstract). Data are tabulated for alkyl-benzenes up to *n*-undecyl-benzene. V. B.

477. Viscosity–temperature-function of organic liquids. W. Wittenberger. *BrennstChemie*, 1953, **34** (13–14), 205–8.—Souders collated, along with consts A and B, the deviations of calc from experimental vals for temps 0°, 20°, 40°, etc., for 43 materials, and concluded that, by incorporating the density, the deviations could be kept $<1\%$ generally.

The visc–temp-function calc on *ca* twice the no. of org liqs showed that, with the exception of the alcohols, the simple linear function $\log \eta = A/T \cdot B$ gives the same accuracy as Sounder's formula, which incorporates, besides η and T, the density of the liq at the given temp. R. T.

478. The time factor in radiation heat exchange. P. Pieper. *BrennstChemie*, 1953, **34** (13–14), 201–5.—Radiant heat exchange is extremely rapid, the actual combustion rate being infinitely great. However, the mixing of gas and air influences the course of combustion strongly and therewith heat development. But the infinitely rapid radiant heat diminishes in importance because the heat released divides instantaneously, approx equally on the colder heating surfaces and the material to be heated. This fact requires notice, it is necessary to examine the time factor of the radiation heat exchange more closely because the firing phenomena in conception and observation of the infinitely rapid heat exchange permit a clearer and simpler interpretation and new explanations. It can be assumed that, in the elementary combustion, actually the theoretical combustion temp rises. In any case, there is no other authentic explanation for any other true combustion temp, for the so-called fire space temps constitute the heat or temp equilibrium between local heat development and heat radiation. The "absorption factor" adopted so far for characterization of the heat radiation from the fire space, the pyrometric and thermal efficiency of a firing mean more or less the same. 17 literature refs. R. T.

479. Effect of pressure on structure viscosity of clay suspensions. R. I. Shishchenko and A. M. Avanesova. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **88**, 103–4.—Sealed rotational viscometer indicating, through electro-magnetic coupling, on oscillograph screen is described. Tests at up to 400 atm showed little change of yield val and visc with pressure for chem (alkali) treated clays, whilst indicating considerable increases for untreated suspensions. V. B.

480. Intensity of valency vibration bands C ≡ C in the Raman spectra of hydrocarbons. P. A. Akishin and V. M. Tatevskii. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **89**, 287–9.—Tests at λ 22938–20336 cm^{-1}, excited by Hg radiation at 22938 cm^{-1}, on 9 acetylenic hydrocarbons (C_5–C_9). Intensity of C ≡ C bands is approx const, irrespective of position (1, 2, or 3) of triple linkage in mol. V. B.

481. Contact-catalytic conversion of alkanes and cyclanes at high temperatures and hydrogen pressures. N. I. Shuikin, S. S. Novikov, and N. G. Berdnikova. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **89**, 1029–32.—*cyclo*Pentane, methyl*cyclo*pentane, *cyclo*hexane, *n*-hexane, *n*-heptane, and *n*-octane passed (space velocity 0·43) over Pt–alumina cat (low Pt content), 15–20 atm H_2 pressure, 460° C. Products subjected to detailed analysis. Aromatic yields on feeds were 7, 30, 80, 5, 12, and 21% respectively. Possible mechanisms of reactions yielding products found are discussed; methylation is of considerable significance. V. B.

ANALYSIS AND TESTING

482. Automatic tester for oil oxidation. Anon. *Petrol. Process.*, 1953, **8** (10), 1524–9.—A detailed description is given of an automatic oxygen absorption unit for running two oxidn tests simultaneously. The apparatus is simple in construction, and numerous photographic views show its unique features. J. W. H.

483. Two successful analyser samplers. B. W. Thomas and R. L. Martin. *Petrol. Process.*, 1953, **8** (10), 1511–13.—Details are given of 2 sampling systems: the first, to give gaseous test samples from a 3-component hydrocarbon stream; the second to furnish test samples to 3 separate analysers from a process stream containing 5 different hydrocarbons and one non-hydrocarbon.

Owing to the wide variation in the densities and boiling points of the components in both streams, unusual care was necessary in this case to maintain the stream composition during conversion of the liq phase stream to the required vapour phase test sample. J. W. H.

484. Plant analyser samplers that work. Anon. *Petrol. Process.*, 1953, **8** (11), 1717–20. 3 systems are described in detail that deliver samples to the petrochemical process analytical instrument installed on the plant process. J. W. H.

485. Electronic gating knockmeter. M. M. Adams. *Oil Gas J.*, 4.1.54, **52** (36), 95.—This instrument permits correlation of signals with crankshaft angles, overcoming limitations in engine testing common to other instruments.

A figure gives the schematic wiring diagram for the knockmeter. G. A. C.

486. Analytical applications of infra-red spectrography in the gas industry. J. Garach. *Chim. anal.*, 1953, **35**, 207–18.—Fundamentals of analytical I.R. spectroscopy are outlined and equipment for I.R. laboratory in range 0·8–15 μ is described. Method is given for determining propylene in commercial propane, with accuracy of $\frac{1}{2}\%$. Test is at atm pressure in 10-cm glass cell, and propylene band at 3·2 μ is used; for propylene contents $>20\%$ gas is diluted with N_2. Application of I.R. analysis to natural gas, cresols, xylenes, indenes, pyridines, and other coal tar products is briefly considered. List of reference spectra determined is given. V. B.

487. Estimation of the steam content of gases, especially dust-laden gases. G. Velling. *BrennstChemie*, 1953, **34** (13–14), 199–201.—The process is based on condensation of the vapour present in the hot gases and the resulting vol decrease. The apparatus is shown in section and its operation described. Equations are developed based on assumed saturation of the gas at the cooling-water temp. Gases have been investigated

which were at 700° C at the sampling position, had a dust content up to 20g/m³ at N.T.P., and a saturation temp *ca* 70° C. R. T.

488. Furfural number for assessing insulating oils. T. Wörner. *Elektrotech. Zeit.*, 1953, **74**, 513–14.—Since gas absorbing properties of oil in an electric field are proportional to aromatic content, simple test for latter would eliminate complicated gas test. Tests on 100 samples of insulating oil, comparing S.K. no. (*cf.* Abs. 2387 of 1951) with gas absorption, gave results with excessive scatter, but by substituting furfural for H_2SO_4 reliable correlation was obtained. Oils with furfural no. $>4{\cdot}5$ absorb gas, those showing <3 evolve, whilst intermediate values indicate initial evolution followed by absorption toward end of test period. Substitution of furfural no. for S.K. no. would indicate both degree of refining and gas absorbing properties. V. B.

489. Rheology of disperse systems. III. Flow properties of drilling muds. K. H. Grodde. *Erdöl u. Khole*, 1953, **6**, 608–13.—(*Cf.* Abs. 192 of 1954.) General requirements of drilling muds discussed, pressure drop in mud circulating system considered, and calc values tabulated for various conditions. Desirable mud properties (for German practice) include yield value of *ca* 100 dynes/cm², although a minimum yield value is favoured in the U.S. Suitable temp for testing flow properties is 50° C; Marsh funnel is convenient field instrument. Stormer viscometer is considered unsuitable, while absolute rheometer, previously described, is recommended for lab tests. Relationship between Marsh outflow times and differential visc and yield values is plotted. Field thixometer for determining yield values has been designed and is described, this gives direct readings by measuring weight of water required to counter-balance resistance to movement of vessel immersed in the mud. V. B.

490. Variation of refractive index of hydrocarbon mixtures with composition. B. V. Ioffe. *Zhur. Priklad. Khim.*, 1953, **26**, 398–405.—$P = \frac{n_1(n-n_2)}{n(n_1-n_2)} \cdot 100 + K(100-P)P$ is proposed as suitable formula to allow for non-linearity of ref index of mixtures. P = wt % of first component (obtained initially by a first approximation), n_1, n_2, n, are ref index of first, second components, and mixture respectively; K is const characteristic of binary system involved and varies from 0·00025 to 0·00351, and is not greatly affected by change of λ or temp. K is tabulated for 44 systems. Test data are given on following mixtures: benzene–turpentine; toluene–methyl*cyclo*hexane; methyl*cyclo*hexane–*n*-heptane; ethylbenzene–octene; ethylbenzene–*n*-octane; *m*-xylene–*n*-octane; octene–*n*-octane; mesitylene–*n*-nonane. V. B.

491. Statistical electronic method for investigating combustion phenomena in reciprocating engines. R. Vichnievsky and J. Weissmann. *Rev. Inst. franç. Pétrole*, 1953, **8**, 423–35.—Methods of measuring pressure rise within engine cyl are reviewed and description given of apparatus for statistical study of combustion phenomena during knocking, comprising pressure change detector and electronic sorting and recording devices, whereby it is possible to separate pressures above a given amplitude, as well as relating occurrence of such pressures to crankshaft angle. Start of knocking can thus be exactly determined, and can vary, by as much as 2·5°, for fuels of same O.N. Layout for study of normal combustion is also described, this enables intensity and duration of such combustion to be measured. Accuracy is 1%, effect of air humidity is very marked. V. B.

GAS

492. Pressure gradients in natural gas reservoirs. D. Cornell and D. L. Katz. *J. Petrol. Tech.*, March 1953, **5** (3), *AIMME Tech. Paper No.* 3503, 61–70.—Means are given for calculating pressure gradients in gas reservoirs by combining the procedure for computing turbulent steady-state gas flow near a well with a graphical method for predicting unsteady state laminar flow at some distance from the well. There is also discussion of methods for predicting single and multiple transients at constant flow rate in an infinite reservoir, predicting constant flow rates in an infinite reservoir, reproducing and interpreting back-pressure test data, and the prediction of the behaviour of a closed-in gas well. The graphical method for a single transient is given, and the results compared with Everdingen and Hurst's analytical solution. The pressure gradient in a reservoir and the production of gas are calculated from data for a back-pressure test. G. D. H.

493. Compressibility of Saint-Marcet natural gas. Measurement and applications. J. P. Verrien. *Rev. Inst. franç. Pétrole*, 1953, **8**, 454–65.—Mol % composition of gas, after removal of CHG, was CH_4 92·26, C_2H_6 4·08, C_3H_8 0·53, butanes 0·08, pentane 0·05, N_2 2·90, CO_2 0·10. Compressibility was measured in special cell (equipment illustrated and described in detail, with operational procedure) of 567 ml capacity, where const mass of gas was maintained at const temp, and vol altered by introduction of Hg, consequent pressure change being measured. Results are given over range 0–350 kg/cm² and 0°–40° C, accuracy 0·07%. Practical application of results (flow measurement and storage under pressure) is discussed. Comparison of theoretically calc and determined values for compressibility factor (Z) shows $Z_{calc} < Z_{det}$ (up to 5% divergence), due to presence of N_2. At all temp investigated Z shows minimum at approx 160 kg/cm². V. B.

ENGINE FUELS

494. Use of heavy fuels in diesel engines of marine auxiliary sizes. J. Smith. *Gas Oil Pwr*, 1953, **48**, 311.—Tests were carried out at 500 and 600 r.p.m. on a single cyl engine of cyl bore and stroke 9 inches and 12 inches respectively, fitted with an open type combustion chamber and 4-valve cyl head. An Al-alloy and a cast iron piston were used. Fuels of visc 600–3000 Red I sec preheated to temp of 160°–210° F to give a visc of 130 Red I sec at the fuel pump, and of S content from 3·4 to 3·8%, were tested.

The exhaust was clear with the 600-sec fuel, and became dirtier as the fuel visc was increased. Thermal efficiency was the same with all fuels. Fuel consumption fluctuated somewhat, due probably to formation and subsequent removal of carbon trumpets on the nozzles. The piston was dirtier than normal and wear was greater.

In a 1000-hr endurance test run intermittenly with a 1500-sec centrifuged fuel, a Cr-plated cyl liner was fitted and the jacket temp controlled at 168° F. The rate of wear and general engine performance are given graphically.

The tests were carried out with SAE 30 lub oil, and it was found that the piston rings showed a tendency to stick. H. C. E.

495. Limitations of boiler fuel for diesels as indicated by service and research experience. G. M. Christie and C. L. Bailey. *Gas Oil Pwr*, 1953, **48**, 303–7.—The article discusses marine tanker service experience, research recommendations, and fuel quality.

In service heavy fuel (up to 3500 sec Red I 100° F) is heated to 160°–190° F and centrifuged before use. The fuel valves are cooled at 115° F. With heavy fuel it was found that for all engines liner wear is doubled. Abrasive wear is mainly responsible, and not wear due to S compound formation. With 2-cycle engines there was an increase in scavenge system deposits. In 4-cycle engines exhaust valve life is reduced by guttering, due probably to the formation of Na_2SO_4 from traces of seawater in the oil. Combustion chamber deposits are but little increased, but with 4-cycle engines there is more spray impingement on the piston crown.

In the laboratory, work was carried out on 4-stroke engines of cyl bore 230, 250, and 400 mm, running at 450, 600, and 333 r.p.m. respectively. The duration of each test was 525 hr, about half being at full load. It was found that some

piston rings were partially stuck, combustion chamber deposits small, and injector nozzles satisfactory, although they bore deposits. All exhaust valves were heavily pitted. Mean wear figures are given for tests on fuels containing varying amounts of potential ash.

It is found that marine main propulsion engines can run on heavy fuel without modification, but fuel injection equipment must be altered. Spray penetration and droplet size should be the same as for diesel fuel. The quality of the fuel is discussed under the headings: visc, C residue, S content, flash and pour points. To reduce the effect of high S content it is essential that the engine should have indirect fresh-water cooling; with seawater cooling the jacket temp is never above 120° F, which is too low to prevent cyl corrosion. H. C. E.

496. Behind the scenes with additives. How fuel oil can be treated to prevent filter and nozzle plugging, tank corrosion. R. A. Stayner and L. H. Dimpfl. *Fuel Oil & Oil Heat*, Dec. 1953, **12** (12), 71.—The processes by which gums and rust appear in burner systems are briefly reviewed. The action of additives in preventing deposits in burner fuel systems and the rusting of burner parts by entrained moisture are also considered. D. K.

LUBRICANTS

497. Diesel engine lubrication maintenance problems. J. W. Luke. *Gas Oil Pwr*, 1953, **48**, 295–8.—The functions of lub oil are defined, and a table lists 9 purposes for which additives are used, together with the type of additive and the mechanism of its action. It was found that H.D. oils gave a cleaner engine, but at the same time other factors may be operative. Thus on a U.S. railway, corrosion of bearings is common with H.D. oils, and cracked pistons were found to be caused by build-up of carbon under the piston crown, thus reducing the heat transfer.

The following maintenance procedures are rigidly standardized: (1) test for water in lub oil, due to failure of liner seal; (2) filter maintenance; (3) visc tests; (4) spectrographic analysis of used oil. Reclaiming of oil is widely practised, although this removes the additive, at an average cost of 12 cents/gal, or 22 cents/gal if the additive is replaced.

The article closes with a discussion on the compatibility of various lub oils. H. C. E.

498. Fundamentals of lubrication and the lubrication of internal combustion engines. F. Evers. *Erdöl u. Kohle*, 1953, **6**, 657–9.—Elementary discussion, including explanation of hydrodynamic and boundary lubrication and of visc pole ht for oils. V. B.

499. Fast spectro method for trace determinations in lub oils. J. T. Rozsa and L. E. Zeeb. *Petrol. Process.*, 1953, **8** (11), 1708–12.—Spectrographic analysis of engine lub oils can result in the avoidance of diesel engine failures, reduced maintenance costs, and longer periods between overhauls. Methods of measuring trace elements in the oil sample are reviewed, and this new technique is explained in detail. The operating parameters are listed, and the procedure for actual measurement on a particular sample is presented. J. W. H.

500. Patents. U.S.P. 2,644,792 (23.12.49; 7.7.53). M. W. Hill, assr to Standard Oil Development Co. Mineral oil containing a product obtained by reacting 1 mol of a phosphorus sulphide with 1–10 mol of a hydrocarbon at 200°–600° F and treating the product at 100°–400° F with a base of the formula $(R_2N)_2C{:}NR$ in which each R is hydrogen or a hydrocarbon radical, or basic reacting salt thereof.

U.S.P. 2,644,793 (30.8.50; 7.7.53). H. W. Rudel and M. Gargisa, assr to Standard Oil Development Co. Mineral lub oil containing a compound to the formula

$$RCOOCH_2CH_2SCH_2COOH$$

in which R is an aliphatic or *cyclo*aliphatic radical of 2–21 carbon atoms.

U.S.P. 2,644,794 (15.11.50; 7.7.53). J. E. Fields, assr to Monsanto Chemical Co. Foam-resisting hydrocarbon oil composition containing a liq mixture of adducts having the formula $RCO[-CH_2CH\ CH\ CH_2O]_nH$, in which R is an alkyl radical of 1–17 carbon atoms and n is 2–20.

U.S.P. 2,644,795 (15.11.50; 7.7.53). J. E. Fields, assr to Monsanto Chemical Co. Foam-resisting hydrocarbon oil composition containing a liq mixture of adducts having the formula $RCO\left[-CH(COOY)-C(COOY)(COOY)-CH_2\right]_nH$, in which R is an alkyl radical of 1–17 carbon atoms, Y is an alkyl radical of 1–8 carbon atoms, and n is 2–20.

U.S.P. 2,644,802 (30.6.50; 7.7.53). J. F. Lontz, assr to E. I. du Pont de Nemours and Co. Tetrafluoroethylene polymer compositions containing polyorganosiloxane lubricants.

U.S.P. 2,644,804 (22.4.50; 7.7.53). L. C. Rubin, assr to M. W. Kellogg Co. Packing composition containing polytrifluorochloroethylene and graphite or molybdenum sulphide.

U.S.P. 2,645,588 (9.3.50; 14.7.53). A. J. Barry, assr to Dow Corning Corpn. Grease comprising a fluid polysiloxane having a visc < 50 cs at 25° C and 1–35% wt silica. The grease is made by replacing water from a silica hydrogel by a water-miscible organic solvent and replacing the solvent by the polysiloxane.

U.S.P. 2,645,613 (14.3.49; 14.7.53). D. E. Adelson and R. E. Thorpe, assrs to Shell Development Co. E.P. lub oil containing 1–10% of a dissimilar metal complex of 2 metal halides of dissimilar metals selected from Ag, Cu, Sn, Mn, and Co with a trialkyl phosphite, arsenite, or antimonite.

U.S.P. 2,645,614 (29.10.51; 14.7.53). W. C. Holmes, assr to Tap and Drill Ez Corpn. Metal-working lubricant in paste form comprising paraffin wax, beeswax, lub oil, and carbon tetrachloride.

U.S.P. 2,646,401 (28.4.50; 21.7.53). R. O'Halloran, assr to Standard Oil Development Co. Grease prepared by mixing a lub oil with a lithium, mixed lithium–strontium, or mixed lithium–calcium soap of an unsaturated fatty acid having an iodine no. above 75, heating to the m.p. of the soap, cooling to its transition temp with agitation and further cooling without agitation.

U.S.P. 2,646,402 (11.2.50; 21.7.53). J. W. Hutcheson and E. C. Knowles, assrs to Texas Co. Preparation of zinc salts of alkyl substituted hydroxy aromatic compounds for use as lub oil additives. J. M. S.

BITUMEN, ASPHALT, AND TAR

501. Causes, avoidance, and removal of waves, wrinkles, bubbles, and other faults in covering with roofing composition. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (11), 309–10.—Pt V discusses briefly premature ageing since the middle thirties, attributed to thinning-out factors, loss of dusting material, surface weathering, felting of inlay, longitudinal and transverse contraction. Pulp quality and steeping are important. An extensive author's summary of the series is given. R. T.

502. Composition roofing processing. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (11), 322–8; **4** (12), 358–60.—In Pt VII roof covering, sealing, and intermediate layers are discussed with numerous supporting drawings of specific applications. Faults, their cause and prevention, in single and multilayer coverings are discussed. In Pt VIII the use of composition roofing for sealing all types of roofs is considered with regard to cause and correction. German and foreign practice are compared with special ref to shingles. For repairs to tar or bitumen coverings similar materials must be used. Val of nutrient addns, fat pitch, oil, etc., and coloured roofings for upkeep is considered. R. T.

503. Bituminous materials, their processing and use mirrored in recent German patent literature. H. Hoffmann. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (11), 310–12; **4** (12), 355–7.—Classification with specification details and drawings. R. T.

504. Tar or asphalt street? H. Mallison. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (11), 305–6.—The rapid test described consists in pressing filter paper moistened with solvent-aromatic-free gasoline, benzene, etc., firmly on to the road surface. Benzene, in contrast to gasoline, dissolves the bitumen surface completely. Bitumen colours the paper very dark brown, tar brownish-yellow to chestnut. The difference is shown clearly in photographs. Sulphonation with conc H_2SO_4 on fine glass cloth, followed by rinsing in water, leaves a very dark brown spot with bitumen and a light-chestnut spot with tar, the sulphonation products of tar being H_2O-sol, those of bitumen H_2O insol. Cut-back bitumen reacts like bitumen, bitumen-tar like tar. The test is unsatisfactory for pronounced tar–bitumen mixtures. R. T.

505. Newer development of road tar research. O. Franck. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (10), 273–81.—Factors affecting efficiency of road tars are discussed fully. Experimental determinations aided by mathematical and physico-chem methods have placed the science of road tars on an exact basis, free from surmise. Suitable tars may be chosen according to origin and properties. Numerous charts and 12 refs. R. T.

506. Rheometry of bitumen. H. Umstätter. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (6), 152–3.—An abridged version of the lecture by R. Schwaben and H. Umstätter at the Rheology Meeting, Berlin, 1952. A mathematical presentation of the relevant theory and an illustration of the rotation viscometer are given. R. T.

507. Bitumen and tar in light tracks of steel road bridges. K. H. Seegers. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (6), 154–8.—A review of the use of tar and asphalt in the progressive economic development of light tracks. Use of additions, *e.g.* rubber and hemp, is discussed. Types of construction are illustrated by sectional drawings and photographs. R. T.

508. Design studies of Indiana-bituminous concrete surface mixtures. W. H. Goetz and J. F. McLaughlin. *Rds & Str.*, 1953, **98** (9), 107.—The U.S. Corps of Engineers employs a design procedure based upon the Marshall Test. Marshall specimens are made at several different bitumen contents. Tests are carried out to give the Marshall values for flow and stability. The unit weight of each specimen is calculated and filled, voids contents calculated. Totals void are also calculated. Graphical representation of these properties against bitumen content is then carried out, and the most satisfactory composition determined. Details of this process are given, together with details of its application in specific cases. It is concluded that although the Marshall test is empirical, it is simple to execute, and may be correlated with practice. It has been correlated with the Triaxial test. R. H.

509. Importance of the standard specifications in road construction and proposed alterations. F. Schulz. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (8), 225–8; **4** (9), 247–9.—Pt I includes observations on DIN 1996, under review by the Research Association for Road Affairs. A lack of well-known theories and methods of binder distribution is stated to exist. The standards do not correspond to current development of road construction technique. They do not permit clear conclusions for the behaviour of coverings under traffic and other influences, and the constructors cannot apply them freely.

Pt II outlines the best procedure for realizing a fundamental solution of the optimum binder distribution problem. Determinations of pen and compression strength are discussed. Suggestions are made for testing coatings containing softer binders for which no useful test is available. 21 literature refs. R. T.

510. Poured asphalt coatings on steel tracks and their testing. O. Kirschmer. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (8), 214–19.—A survey of asphalt coatings on numerous steel bridges. The coating for bridges of orthotropic steel plate (wt 150–180 kg/cm²) should be <100 kg/cm². Coatings are considered in relation to corrosion, smooth ice dangers, oscillation (no damping), and noise. Properties required (for temp span $-20°$ to $+50°$ C), are freedom from cracks, elasticity, stability, insulation, etc. Requirements are more stringent than for road construction (DIN 1995/6). Mechanical aids, steel gauze, expanded metal and zigzag, raised metal bars prevent sliding and wave formation. The use of plastics, moltoprene, rubber, and metal foil is discussed. Asphalt is applied hot or cold or in sheets. The coatings have given satisfaction, but cannot be typified nor standardized. Each construction must be considered. Conventional thickness of coatings is 5 cm, $\sim$ 1 cm mastic, 2–2·5 cm softer insulation, and 2–2·5 cm harder sealing layer. Pulsator, rolling, and punch tests for eff of coatings are discussed. R. T.

511. Bituminous materials, their processing and use mirrored in recent German patent literature. H. Hoffmann. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (9), 254–6; **4** (10), 288–91.—Continuation of the classified groups of patent specifications appearing since 1950. Full descriptions with sectional drawings. R. T.

512. Patents. U.S.P. 2,644,741 (1.6.51; 7.7.53). E. H. King and J. S. Schumacher, assrs to Hill and Griffith Co. Composition comprising 90–30% pulverized bituminous plastic and 10–70% of the solid residue resulting from the acid hydrolysis of pentosan-containing material to form furfural, is used for moulding sand.

U.S.P. 2,645,524 (1.9.50; 14.7.53). K. C. Kelly. Bitumen spraying device.

U.S.P. 2,647,090–1 (20.7.51; 26.1.53; 28.7.53). J. M. McColgan, assr to Stauffer Chemical Co. Compositions for battery boxes having increased resistance to acid attack. Bitumen is used as the binder for mineral filler and resin impregnated organic fibres. J. M. S.

SPECIAL HYDROCARBON PRODUCTS

513. Determination of constants of pure *o*-xylene and development of criteria for characterization of the technical material. L. Ya. Kolyandr *et al.* *Zhur. Priklad. Khim.*, 1953, **26**, 438–42.—*d* and *n* are not suitable for analysis of tech *o*-xylene (from coke ovens) owing to influence of non-aromatic hydrocarbons. Production can suitably be controlled by dist under standard conditions but best purity check is temp of crystallization ($-25·3°$ C). Unsulphonatable residue in tech *o*-xylene is largely propyl*cyclo*hexane, which forms azeotrope with *o*-xylene. Effect on constants of latter of addition of such unsulphonatable residue and of *m*-xylene is tabulated. Pure *o*-xylene can only be obtained by hydrolysis of the sulphonic acid or by cryst of the crude fraction. V. B.

514. Effect of an electric field on petroleum oils and mixtures thereof with polymerized hydrocarbons. V. A. Golubtsova. *Doklad. Akad. Nauk. S.S.S.R.*, 1953, **88**, 821–4.—Tests in H_2 atm (7 kV/mm, 50 cs, 30° C, 6 hr, apparatus illustrated) on bright stock–poly*iso*butylene–rosin blends showed gas evolution (coupled with slight increase in I val) for bright stock and bright stock + P.I.B. but absorption after addition of rosin. Fall of I val of rosin mixtures after test suggests absorption of H_2 causes hydrogenation of unsaturated linkages in the abietic acid. V. B.

515. Patents. U.S.P. 2,644,196 (20.11.48; 7.7.53). A. J. Bevevino, assr to L. Sonneborn Sons Inc. Wax is slabbed by reeling a continuous sheet of wax to form a multilayered tubular band, cutting the band from the sheet, and compressing it into slab form.

U.S.P. 2,644,645 (20.11.48; 7.7.53). A. J. Bevevino, assr. to L. Sonneborn Sons Inc. Wax winding and slabbing device.

U.S.P. 2,644,742 (24.2.50; 7.7.53). R. C. Danison, assr to Diamond Alkali Co. Small proportion of mineral oil is added to a charge comprising silica and soda ash, caustic soda, or sodium bicarbonate used to form sodium silicate glass.

U.S.P. 2,644,796 (22.11.34; 7.7.53). H. P. Averill and R. Pfanstiel, assrs to U.S.A. (Secretary of War). Water-in-oil emulsion for the destruction of bis (β-chloroethyl) sulphide comprising water, kerosine, and a reaction product of horse oil and magnesium carbonate, oxide, or hydroxide.

U.S.P. 2,645,572 (22.12.49; 14.7.53). F. F. Blicke, assr to Regents of University of Michigan. Herbicidal compositions containing 3-thianaphthenyloxyacetic acid or a salt or ester thereof.

U.S.P. 2,645,592 (2.3.50; 14.7.53). R. G. Campbell, assr to Stauffer Chemical Co. Acaracidal compositions containing 4-chloro- or 4-bromo-phenyl-4′-fluorophenyl sulphone.

U.S.P. 2,646,350 (17.6.50; 21.7.53). F. S. Rostler, assr to Golden Bear Oil Co. Herbicidal composition comprising an oil-in-water emulsion of a resinous pet fraction having a fl. pt. above 250° C containing a dissolved herbicide.

U.S.P. 2,646,361 (26.6.50; 21.7.53). F. S. Rostler, assr to Golden Bear Oil Co. Dust-laying oil-in-water emulsion of a resinous pet fraction.

U.S.P. 2,646,362 (30.6.50; 21.7.53). R. G. Capell, W. P. Ridenour, and J. A. Stewart, assrs to Gulf Research and Development Co. Hydroquinone monobenzyl ether is used to inhibit oxidn of paraffin waxes.

U.S.P. 2,646,363 (12.4.50; 21.7.53). R. R. Parmentier. Sealing composition for transparentized paper comprising 2–6% vol pet wax having m.p. from 115° to 200° F, 31–47% vol gasoline, and 47–67% vol carbon tetrachloride.

U.S.P. 2,646,369 (12.4.50; 21.7.53). R. R. Parmentier. Transparentizing paper by applying a sol comprising 10–35% vol lub oil, 4–10% vol benzene, toluene, or xylene, and 55–80% vol carbon tetrachloride, and then applying the sealing composition of U.S.P. 2,646,363.

U.S.P. 2,647,048 (7.3.47; 28.7.53). H. Ellern, assr to Universal Match Corpn. Stiffening impregant for paperboard comprising white refined paraffin, limed rosin, gilsonite, and a polyamide of stearic acid.

U.S.P. 2,647,060 (13.2.50; 28.7.53). W. N. B. Armstrong and H. S. Kredentser, assrs to Ontario Research Foundation. Duplicating ink comprising a wax–oil colour blend, clay filler, a friable resin, a blend of primary amides of long chain fatty acids, ethyl cellulose, and a solvent. J. M. S.

DERIVED CHEMICAL PRODUCTS

516. Petrochemicals in the post-war years. Anon. *Petrol. Process.*, 1953, **8** (10), 1537–9.—A sharp up-swing in petrochemical manufacture since the second world war has already been apparent, and it is expected that production will reach a volume of 31·5 billion lb annually in 1955. The various petrochemical products and their uses are discussed and their future availability reviewed. J. W. H.

517. Shell's new plant in France. Anon. *Petrol. Process.*, 1953, **8** (10), 1546.—An annual production of 7500 tons of propylene-based petrochemicals, mostly in the form of acetone, is expected from a new plant put into operation at Berre, France, by Royal Dutch Shell. The feedstock consists of a propylene–propane mixture, produced by thermal and cat cracking of Mid-Eastern crude, followed by purification in a Girbotol unit. J. W. H.

518. Patents. U.S.P. 2,644,826 (15.6.51; 7.7.53). J. D. Spivack, assr to Tide Water Associated Oil Co. Di (N-carboxyalkyl alkanamides) in which the alkanoyl radical of the alkanamide group is an alkanoyl residue of a long chain fatty acid.

U.S.P. 2,645,593 (9.2.51; 14.7.53). A. M. Erskine. N-Alkylbenzyltrimethyl ammonium naphthenates.

U.S.P. 2,645,615 (G.B. 3.3.48; 14.7.53). F. J. Pollock, assr to I.C.I. Ltd. Aq soln of synthetic anionic or non-ionic detergents are thickened with an alkali metal salt of an acid ester of a polyvinyl alcohol partially esterified by maleic acid and acetic acid.

U.S.P. 2,645,657 (30.3.49; 14.7.53). H. W. Rudel and J. I. Wasson, assrs to Standard Oil Development Co. Compounds of the formula $((RO)_2PSSR'COO)_nM$, where R is an alkyl, *cyclo*alkyl, aryl, aralkyl, or alkaryl radical, R′ is a saturated aliphatic hydrocarbon radical, M is hydrogen or an alkaline earth metal, and n is 1 or 2.

U.S.P. 2,645,659 (29.8.49; 14.7.53). R. C. Morris and J. L. Van Winkle, assrs to Shell Development Co. Sulphur-containing ethers of polyhydric alcohols and derivatives thereof.

U.S.P. 2,645,669 (23.2.50; 14.7.53). H. Pines and V. N. Ipatieff, assrs to Universal Oil Products Co. Trialkyl*cyclo*alkaryl (perhydro*cyclo*alka) indans.

U.S.P. 2,647,117 (29.11.49; 28.7.53). H. D. Hartough, J. J. Dickert, and S. L. Meisel, assrs to Socony-Vacuum Oil Co. Bis(tetrahydro-1 : 3-oxazino)-alkanes.

U.S.P. 2,647,118 (22.6.50; 28.7.53). H. D. Hartough, J. J. Dickert, and S. L. Meisel, assrs to Socony-Vacuum Oil Co. Bis-(tetrahydro-1 : 3-oxazino)-methanes are made by reacting an olefinic compound with formaldehyde and an ammonium halide at 55°–70° C. J. M. S.

COAL, SHALE, AND PEAT

519. Special coal-tar pitches and their use for anti-corrosion and structure-protection, with special reference to pipeline protection. K. Meyer. *Erdöl u. Kohle*, 1953, **6**, 619–23.—Special pitches ("Synoplast," "Plastix") have high contents of high mol. wt. resins and low mol. wt. oils, and are obtained by using latter to flux either blown pitches or high m.p. (130° C) dist residue pitches; they have wide range (>100° C) between softening and break points. Direct hot (*ca* 130° C) application, *e.g.* to pipe, yields coat 1–5 mm thick, they can also be used in solvents for cold application. Examples of some pipelines protected with these materials, and other uses for them, are described. V. B.

MISCELLANEOUS PRODUCTS

520. Esters of titanium and their use in paints. G. Winter. *J. Oil Col. Chem. Ass.*, Dec. 1953, **36** (402), 689.—The preparation of polymeric esters is described: (1) by partial hydrolysis of the monomer using various amounts of water dissolved in butanol; (2) by direct reaction of titanium tetrachloride, butyl alcohol, and water.

Rates of hydrolysis of various alkyl titanium esters were determined and analyses made of the ultimate products of hydrolysis. The formulation of butyl titanate paints with leafing and non-leafing pigments is considered. These paints were tested as heat-resisting coatings and as protective coatings for steel against corrosion by seawater. Some preliminary work on butyl titanate anti-fouling paints is also noted. 10 literature refs. D. K.

521. Hand cleaners. Anon. *Soap, N.Y.*, June, 1953, **29** (6), 87.—A summary of an article appearing in Schimmel Briefs, March 1953, is given. The use of deodorized kerosine, mineral spirits, high flash coal tar naphtha, and chlorinated hydrocarbons in hand cleaners is discussed. Formulæ are given. M. V. J.

522. Some applications of statistical methods to exposure trials. Pt 1: Analysis of exposure data. H. R. Touchin. *J. Oil Col. Chem. Ass.*, Dec. 1953, **36** (402), 709.—Examples are given of the statistical analysis of exposure data. Advantages to be gained by applying statistical methods are discussed, as also are the limitations imposed by the normal methods of rating exposure panels. There are 23 literature refs.
D. K.

523. Field testing quaternaries. G. B. Johnson. *Soap, N.Y.*, July 1953, **29** (7), 114.—A simple field test for determining the concentration of quaternary ammonium germicides in sanitizing soln is described. Glass colour standards are used for determining the intensity of colour produced by the reaction between quaternary ammonium compounds and bromophenol blue. 4 refs. M. V. J.

524. Toxicity of strobane. H. A. Shelanski and M. V. Shelanski. *Soap, N.Y.*, July 1953, **29** (7), 129.—Acute and chronic toxicity studies of strobane (chlorinated terpene) using rats, guinea-pigs, and rabbits are reported. It was concluded that orally administered quantities over 75 mg/kg of body weight are toxic in single doses, but that strobane is not cumulative in action. 1% soln of strobane in white oil may be safely and repeatedly applied to the skin in 1 cc/kg and 2 cc/kg quantities, a 5% soln, however, produced convulsions and death. Exposure to aerosols containing 5% strobane over considerable periods can be considered safe. M. V. J.

525. Soap for wool scouring. J. L. Boyle. *Soap, N.Y.*, July 1953, **29** (7), 36.—Wool scouring is discussed with particular reference to functions and amounts of soap and alkali used.
M. V. J.

526. Actamer in liquid soaps. R. R. Egan and M. D. Reed. *Soap, N.Y.*, July 1953, **29** (7), 42.—Handwashing tests carried out using 0·5 and 0·67% actamer (2 : 2′-thiobis-(4 : 6-dichlorophenol)) in dilutions of various liq soaps showed that a 90% reduction in bacterial count is achieved by the fifth day of washing. Variation of pH did not affect Actamer's germicidal activity. No skin irritation occurred. There was some indication that the iodine value of the soap oils should not exceed 60. 3 refs. M. V. J.

527. Sanitation management in housefly control. R. J. Dicke. *Soap, N.Y.*, July 1953, **29** (7), 113.—A survey of 21 diary farms during the summer of 1952 indicated that insecticide spraying is only effective when used in conjunction with limitation of fly breeding. Weekly removal of manure in stock pens and complete elimination of barnyard accumulations are recommended. M. V. J.

528. Patents. U.S.P. 2,644,801 (24.9.49; 7.7.53). G. F. D'Alelio, assr to Koppers Co. Sulphonated polymers of aryl acetylene compounds.

U.S.P. 2,644,807 (8.3.51; 7.7.53). H. S. Bloch, assr to Universal Oil Products Co. Resinous condensation product of a partially hydrolysed polyvinyl alcohol ester homopolymer and a condensation product of ammonia and butyraldehyde.

U.S.P. 2,645,621 (24.9.49; 14.7.53). G. F. D'Alelio, assr to Koppers Co. Sulphonated aromatic hydrocarbon–aliphatic polyene hydrocarbon ion-exchange resins.

U.S.P. 2,645,622 (1.7.50; 14.7.53). D. H. Praeg, assr to Sun Chemical Corpn. Vehicle for printing inks comprising a glycol-soluble, water-insoluble resinous binder dissolved in a liq polyglycol and an alcohol-soluble N-alkoxymethyl polymethylene polyamide.

U.S.P. 2,646,422 (16.3.51; 21.7.53). D. E. Strain, assr to E. I. du Pont de Nemours and Co. Cured chlorosulphonated interpolymers of diolefins. J. M. S.

CORROSION

529. Cathodic protection of under-river pipelines. C. C. Loyd and J. R. Whitney. *Corrosion*, 1953, **9** (9), 303–6.—Details are given of the installation for protecting the pipelines crossing the Mississippi at Baton Rouge. K. G. B.

530. Patents. U.S.P. 2,646,399 (28.12.50; 21.7.53). W. B. Hughes, assr to Cities Service Research and Development Co. Metal equipment is protected from the corrosive action of oil well fluids by adding to such fluids a product obtained by reacting 1 mol of a dibasic acid with 2 mol of a polyethylene polyamine and heating the reaction mixture to produce a bis-imidazoline.

U.S.P. 2,646,400 (24.2.51; 21.7.53). W. B. Hughes, assr to Cities Service Research and Development Co. Metal equipment is protected from the corrosive action of oil well brines by adding to such brines a product obtained by reacting triethylenetetramine or tetraethylenepentamine with an aldehyde and heating to drive off the water formed in the reaction. J. M. S.

ENGINES AND AUTOMOTIVE EQUIPMENT

531. Pressure-charged horizontal A.E.C. [diesel] unit. Anon. *Gas Oil Pwr*, 1953, **48**, 236.—This 6-cyl engine has cyl of bore and stroke 130 and 142 mm respectively, giving an output at 1800 r.p.m. of 154 and 200 b.h.p. when turbo-charged.

Injection is direct into toroidal combustion chambers, and masked inlet valves impart swirl. Al-alloy pistons are used, and pressure-charging is by Brown-Boveri turbo-blower.

On a 100-hr test at 1800 r.p.m. the max output fluctuated between 205 and 215 b.h.p. The specific fuel consumption was 0·375–0·38 lb/b.h.p.hr. H. C. E.

532. Operating results from a Nordberg Supairthermal dual fuel engine. C. H. Guernsey. *Gas Oil Pwr*, 1953, **48**, 249.—This 8-cyl engine has cyl of bore 13 inch and stroke 16½ inch, and is rated at 1425 b.h.p. at 450 r.p.m. Its average fuel consumption is 11 cu. ft. gas + 10% pilot oil per kW-hr. Lub oil consumption was very low.

An Elliot turbo-pressure charger compresses the intake air to 15 p.s.i. and heats it to 240° F, from which it is cooled to 100° F by a shell water cooler. At low loads the intake air is throttled automatically, control being by governor and exhaust temp controlled through pneumatic motor.

Engine jacket water cools the lub oil through a continuously-operating by-pass filter. H. C. E.

533. Development of a diesel fuel additive. M. W. Webber. *Gas Oil Pwr*, 1953, **48**, 233–5.—Incomplete combustion leads to the formation, *inter alia*, of carbons and resins which lead to the formation of lacquer and deposits on the pistons. Detergent lub oils keep the pistons and rings clean, but do not improve conditions in the combustion chamber. Further, some oils have an additive content which is low and is based on the results of lab tests. In view of this experience the addition of organo-metallic compounds to the fuel was tried and found beneficial.

To provide complete combustion metallic cats were added. Test runs were made with a Petter engine on a 9 : 1 gas oil–residual fuel oil blend of Conradson C value 0·6% and S content 1·2%, to which organic oil-soluble compounds of Ba, Ca, and Mn, and an ignition promoter containing oxygen, were added. Tests were made with: (*a*) heavy fuel, HD30 detergent lubricant; (*b*) heavy fuel, SAE 30 lubricant; (*c*) heavy fuel + 1% additive, SAE 30 lubricant; (*d*) heavy fuel + 1% additive, HD30 lubricant. Cleanliness of ring grooves was rated in the

order (*d*) > (*a*) > (*c*) > (*b*). Cleanliness of exhaust system was rated in the order (*d*) > (*c*) > (*a*) > (*b*). Weights of exhaust port deposit were (*a*) > (*b*) > (*c*) > (*d*).

More recently the halogen and S compounds have been replaced by organic phosphates, which act as corrosion inhibitors. Lanolin derivatives are included for additional lubricant action, and the aromatic solvent itself helps to eliminate deposits in storage systems. The fuel additive reduces deposits on the injector nozzles, and increased power is accompanied by decreased consumption of fuel and lubricant. H. C. E.

534. Combustion in compression-ignition engines. S. J. Davies. *Gas Oil Pwr*, 1953, **48**, 251–5.—A review of ignition and combustion characteristics from 1931 onwards.

Beginning with a study of the conditions governing ignition, and the shape of the pressure-indicator diagram in the cyl, the behaviour of 14 fuels in 4 engines was examined. It was concluded that whereas for any given fuel the value of the ignition lag and the form of the curve of pressure rise may change from engine to engine, or for the same engine with change of running conditions, the order of the values for ignition lag in all engines under steady conditions for a series of fuels is the same. The origin of the cetane number as an evaluation for fuels is described.

On the question of vaporization of fuel before ignition, it was shown that ease of vaporization is not the dominant factor in the quality of the ignition. 2 theories have been proposed as alternative explanations; one involving peroxide formation, the other postulating a limited amount of thermal cracking preceding ignition. From laboratory experiments on single droplets of gas oil, water, and alcohol it was concluded that: (*a*) ignition begins in the vapour phase; (*b*) formation of carbon is the result of a cracking process, and the heat from this causes an increase in vaporization; (*c*) the carbon burns brightly after a very short life. The implications of these results in designing a combustion chamber are discussed.

Modern techniques and the effect of pressure charging are described.

In the future, developments in combustion will be reflected in the construction of engines of smaller cyl size and higher r.p.m., and the attainment of higher m.e.p.s by means of pressure charging. Reasons for the present trend of black smoky emissions from heavy vehicles are discussed.

H. C. E.

535. Cleaning of engine air, IV: Test procedure for air cleaners. J. L. Koffman. *Gas Oil Pwr*, 1953, **48**, 238–41.—Cleaners are tested by blowing air through at rates varying from 10 to 100% of max flow over a series of 2-hr cycles. In addition, tests must be carried out under steady conditions at 100, 80, 50, 20, and 10% of max flow, when the efficiency η should be 99, 99, 99, 95, and 90% respectively. The loss of pressure with a loaded filter must also be found. The efficiency is found from the equation

$$\eta = (c\text{-}a)/(b\text{-}d\text{-}e)$$

where a is the wt of cleaner before test, b is wt of dust used, c is wt of cleaner after test, d and e are wts of dust remaining in feed and test chamber. With oil bath air cleaners, clean air should be used until there is no further loss in wt.

Methods of feeding the dust into the air are described. Various specifications for the dust to be employed in the cleaner tests are set out. H. C. E.

536. Combustion fundamentals of heavy duty gas engines. W. K. Newcomb. *Gas Oil Pwr*, 1953, **48**, 284–7.—Commencing with a comparison of the theoretical and actual Otto cycles, the combustion process in spark ignition engines is discussed in detail. It is shown that when the C.R. is raised the specific fuel consumption is decreased and the max output of the engine increased. At the same time, however, the max firing pressure is increased and engine parts and bearings must be correspondingly strengthened.

In a heavy duty engine normal combustion begins 20° before t.d.c. and the max firing pressure is reached 10° after t.d.c. with the mixture burning normally. In detonating combustion auto-ignition occurs ahead of the flame front to produce explosion rather than burning. Factors affecting detonation are listed. The gas engine operates on fuel which has good antiknock properties; the critical C.R. of a number of paraffinic hydrocarbons is given.

The difference between detonation pre-ignition and rough combustion is described.

It is shown that as the gas–air ratio is increased, a vacuum reading on the inlet manifold passes through a max, which is the setting for max power. Operation on a low gas–air ratio is not detrimental to the engine. As the engine timing is increased the manifold vacuum passes through a max, which is the point at which the timing is correct. H. C. E.

537. Demonstration of work at B.I.C.E.R.A. [British Internal Combustion Engine Research Association]. Anon. *Gas Oil Pwr*, 1953, **48**, 258–9, 273.—An account of a high-pressure charging problem now under consideration at BICERA laboratories.

When an atmospherically-charged C.I. engine is modified for turbo-charging, the C.R. has to be lowered to allow for the increase in air pressure. It was found that when, by this means, the output was raised to a b.m.e.p. of 252 p.s.i. the max cyl pressure was 350 p.s.i. higher than the designed working pressure, despite the fact that the fuel injection period was increased to 50° crank angle. To overcome this difficulty the procedure was adopted of using a moderate cyl pressure at full load, and to maintain this max pressure as the load was reduced by increasing the C.R. This had the following advantages: high output without exceptional strain on the engine components; high expansion ratios at part loads giving the highest thermal efficiency; maintenance of optimum compression conditions for combustion throughout the load range; easy starting.

The C.R. was varied by a novel piston design. The piston comprises an inner part A mounted on the gudgeon pin and a shell B sliding over A arranged to form an upper chamber beneath the crown and an annular chamber inside the skirt. These chambers are kept full of oil from the engine system. When the max cyl pressure is exceeded a valve opens to permit oil to leave the upper chamber, thus permitting B to move relative to A and increasing the cyl volume. Since B tends to move upwards by inertia forces, when the engine is running at steady load B is subject to equilibrium forces. When the load decreases the max cyl pressure decreases, the valve remains closed for a few cycles, and B moves to a new position by impulse of oil from the lower chamber.

To reduce the fuel injection period a servo-operated pump was designed in which a constant fuel supply at 1000 p.s.i. is delivered continuously to an accumulator, at the same time compressing air in the accumulator. The air then forces fuel into a chamber, where it acts on a piston connected to the injection pump plunger which delivers fuel in the conventional way. Using this design a 16-mm plunger gives up to twice the amount of fuel delivered by an 18-mm unit of conventional design. H. C. E.

538. Dual fuel engines. G. A. Keep and K. M. Cummins. *Gas Oil Pwr*, 1953, **48**, 293–4, 298.—Details of tests carried out on 650-h.p. units with cyl of bore 400 mm and stroke 600 mm, operating at 300 r.p.m., at Mogden Purification Works. Engines ran at constant oil injection of 1·75–3%, and the gas input was controlled by the governor. There was difficulty in arranging the number and size of the nozzle holes so that equal efficiency was obtained both with pilot oil and with oil only. The fuel nozzles were not cooled. If the gas pressure is reasonably constant it is not necessary to govern the supply to each cyl separately. The method of mixing gas and air in the manifold might lead to inlet and exhaust valves being open together; a better method is to have a separate gas passage with the gas valve mounted on the air inlet valve stem.

The article closes with figures of average wear per 1000 or 10,000 hr; maintenance, running, and operating costs.

H. C. E.

539. Operational conditions of air-cooled diesel engines. R. Kloss. *Gas Oil Pwr*, 1953, **48**, 308–10.—The power required for generating the cooling air rises as the cyl volume increases, and air cooling becomes uneconomic when more than 10% of engine output is required. It is essential that: (1) the mean cyl temp should be higher than the dew point of the exhaust gases (65° C) even at part load; (2) this temp should be exceeded as soon as possible after starting the engine. In both cases air cooling is superior to water cooling, and in tests the amount of cyl wear is only a half to a third with air cooling as compared with water cooling.

Since the max jacket temp available with water cooling is only *ca* 85° C and an air-cooled engine can work at a temp close to its optimum conditions, the fuel consumption in the latter case is reduced. On the other hand, the higher operating temp causes preheating of intake air and lowering of volumetric efficiency by about 6% for each 100° C rise in cyl temp, so that the cyl capacity must be increased.

Air cooling is advantageous at extreme ambient temp; engines can run in temp as high as 60° C, and at low temp starting is easily accomplished by heating the cyl and cyl heads directly. Maintenance costs are lower. Some disadvantages are increased noise and possible thermal distortion of the finned cyl. H. C. E.

540. Pistons and rings for high-output diesel engines. J. W. Pennington. *Gas Oil Pwr*, 1953, **48**, 281–3, 287.—The principal problems affecting pistons are: (*a*) structural failures in the piston crown; (*b*) deterioration of the ring grooves; (*c*) deposits in the ring belt. The characteristics of various metals and alloys used in the manufacture of pistons are discussed.

Ring sticking is affected by many factors, of which the chief are fuel, lub oil, and piston temp. The latter is controlled by piston design, and reduced either mechanically or by arranging for the underside of the crown to be oil-cooled. For engines prone to ring sticking, possible remedies are: (1) rings with additional side clearance; (2) use of keystone rings. Piston ring trouble usually affects only 5–10% of cyl, and in most cases operational conditions are primarily responsible.

For effective oil control the ring must conform to the cyl wall, and must exert an optimum pressure on the cyl wall. The latter can be increased by increasing ring tension or decreasing ring face area; both remedies increase the rate of wear. Methods of making oil control rings capable of withstanding severe conditions are described.

Recommendations for piston ring arrangements in 2-stroke and 4-stroke engines are made. H. C. E.

541. A theory of vortex combustion-chamber design: Pt 1. H. A. Havemann. *J. Inst. Fuel*, Dec. 1953, **26** (155), 294.—The theory of the design of vortex combustion-chambers for the burning of heavy fuel oil or pulverized solid fuel is discussed with reference to wall shape, size, and distribution of particles suspended and in equilibrium, the motion of particles on burning and entrance conditions. The effect of varying certain conditions, *e.g.* mass flow, state of entry of gases, etc., is also considered. D. K.

542. Motive power for railways. C. M. Cook. *Gas Oil Pwr*, 1953, **48**, 288–90, 292.—The diesel electric and the gas turbine locomotives are considered as alternatives to the steam locomotive.

The diesel electric locomotive can operate at full power over a wide range of road speeds, and hence is most useful in shunting duties. In the U.K. only 6 main line diesel locomotives are operating. In the U.S.A. the cost of fuel for diesels is about 50 and 30% for main line operating and shunting respectively, compared with steam locomotives; maintenance and repair costs are about 30–50%. The capital cost of diesels is about double in the U.K., but their availability is almost twice as great.

The thermal efficiency of the gas turbine locomotive is about 15·5%, compared with 26% for a diesel, but the former are still in the experimental stage, and only 2 are in operation on British Railways. Diesel or residual fuel oil is used as fuel, but a gas turbine locomotive burning coal is being constructed in the U.K. At present the gas turbine locomotive costs less in initial outlay and maintenance, but since its efficiency is lower there is no net saving. Dynamometer car trials indicate that the turbine locomotive is but little better than a steam locomotive. H. C. E.

543. New Alco rail traction diesel. Anon. *Gas Oil Pwr*, 1953, **48**, 276.—This 800-h.p. switching locomotive is powered by a Model 251A 4-stroke engine with 6 cyl of bore 9 inches and stroke 10½ inches, operating at 1000 r.p.m. Turbo pressure charging is employed. The lub oil system is built as an integral unit, and includes filters, strainers, cooler, and pressure regulator. Oil-cooled cast iron pistons are used, and the cast iron cyl heads are equipped with 2 inlet and 2 exhaust valves. Individual fuel pumps are fitted for each cyl. H. C. E.

544. Pametrada marine gas turbine. Anon. *Mot. Ship*, Nov. 1953, **34** (404), 350.—The progress made in the development of the 3500-s.h.p. unit, intended for installation in a tanker, is reported. Increased efficiency has been obtained, and progress made towards the use of heavy fuel. U. M.

545. Gas-turbine progress in Switzerland. Anon. *Mot. Ship*, Nov. 1953, **34** (404), 349.—A short review of the work carried out and in hand at Brown-Boveri, Escher Wyss, Sulzer Bros, and Maschinenfabrik is given. U. M.

546. Operation of a marine gas turbine under sea conditions. J. Lamb and R. M. Duggan. *Mot. Ship*, Nov. 1953, **34** (404), 336.—Extracts are given from a paper presented to the Institute of Marine Engineers on 13.10.53, in which the operation of a 1200-b.h.p. open cycle, non-reversible B.T.H. gas turbine set installed in the *Auris* was described. The set was designed in order to determine the problems likely to arise from long continuous operation, varying conditions of atmosphere and sea, and the burning of heavier grades of liq fuel; it has been in operation for 2 years. The layout of the set, general operation, routine inspection, and 2 forms of corrosive attack encountered are described. Notes on the discussion which followed the presentation of the paper are included. U. M.

547. Stuart Turner 2-stroke marine engine. Anon. *Gas Oil Pwr*, 1953, **48**, 261–3.—This loop-scavenged 2-stroke unit has cyl of 2¾ inches bore and 4 inches stroke, giving an output of 9 h.p. at 1500 r.p.m. The combustion chamber is entirely within the piston crown, and the C.R. is 16½ : 1. The cast iron pistons are fitted with 4 compression and one scraper rings.

The air-scavenge pump comprises 2 Al-alloy pistons coupled by a yoke and driven from the crankshaft. The valves form 2 concentric rings, with the suction valves inside the delivery valves. Air enters through the centre of the valve and passes through 6 slots normally closed by Be–Cu leaf springs. Compressed air is delivered to the annular space between the valves to the inside of the valve casing and through slots in the cyl flange to an annular cavity in the crankcase. Thence it passes to a transverse passage above the centre main bearing, and a slot admits air to the air chest in the power cyl block.

Pressure lubrication is supplied by a pump in the sump to the main and big end bearings, with an intermittent supply to the small ends. The camshaft, governor, etc., are splash-lubricated. The engine is cooled by seawater circulated by means of a plunger pump at 80 g.p.h. H. C. E.

548. Rolls-Royce RM60 naval gas turbine. Anon. *Gas Oil Pwr*, 1953, **48**, 264–71.—For naval requirements this set operates on the compound cycle. High and low compression is used with inter-cooling, and the power turbine is mechanically independent of the compressor turbines. A L.P. axial compressor supplies air to a centrifugal H.P. compressor with seawater inter-cooling between. The air then passes to a heat-exchanger in the exhaust stream, thence to one of 2 combustion chambers. Expansion occurs through a single stage H.P.

turbine driving the H.P. compressor, a 2-stage power turbine, and a 2-stage L.P. turbine driving the L.P. compressor.

The L.P. and H.P. units, power turbine, reduction gear, and heat exchanger are described in detail. The 3 major units each carry pressure and scavenge oil pumps. The L.P. and H.P. compressor performances are shown graphically.

The combustion chambers have a stainless steel air casing and a flame tube and air swirl assembly of Nimonic 75 alloy. The axial burner injects fuel through 3 concentric metering orifices. The fuel supply to the burners is controlled by varying the stroke of the plunger fuel pumps. Each combustion chamber contains a torch igniter with fuel atomizer and H.T. sparking plug.

The set is rated at 5400 b.h.p. to give a shaft speed of 675 r.p.m., and has a thermal efficiency of 21·2%. The specific fuel consumption is 0·66 lb/b.p.h.hr. The set is controlled by a throttle hand wheel and 4 levers which operate the starting throttle, propeller pitch, heat exchanger bypass, and fuel cock. The starting procedure is described in detail.

2 sets are installed in a gunboat of 220 tons displacement.

H. C. E.

549. Future gas turbine trends. Anon. *Gas Oil Pwr*, 1953, **48**, 242–3, 245.—Discusses gas turbines: (*a*) in locomotives; (*b*) for power generation; (*c*) in naval and merchant ships; (*d*) small gas turbines.

(*a*) The need is for a different cycle for a single turbine or the use of multiple engines. British Railways use 2 locomotives. The Brown-Boveri unit operates at 600° C, but is able to burn residual fuel; the Metropolitan-Vickers set operates on diesel oil. Both utilize the wrong cyle and operate at too low a temp; neither are designed for burning coal or peat. The ideal locomotive for the U.K. should do this, and also have a cruising engine for low power running, with a coupled boost engine for high power running, and should operate at 700°–800° C.

(*b*) Until operation on indigenous fuel is possible, further equipment should not be installed. Even then the sets will be expensive in first cost and will not be more efficient than steam sets.

(*c*) In this field the types of engine and cycles are basically correct, but although the nature of the fuel is less important, it is desirable that turbines should operate either on residual or dist fuels. With the former the corrosive effect of V_2O_5 is still a major problem.

(*d*) A simple type of set is essential for short period operation and portability, but this would entail using a high-grade fuel with high fuel consumption. It is envisaged that a simple cycle single-shaft engine of 500 h.p. with approx stoichiometric air–fuel ratio and water-cooled combustion chamber, rotor, blades, and turbine casings may be suitable. Another problem is the design of a flexible joint for hot ducting to withstand pressures of 200 p.s.i. and temp of 800° C.

H. C. E.

550. Patents. U.S.P. 2,645,751 (7.7.49; 14.7.53). H. L. Byerlay, assr to Hastings Manufacturing Co. Visual analysing device for the ignition systems of I.C. engines.

U.S.P. 2,645,906 (2.1.51; 21.7.53). M. A. Ryan, assr to Phillips Petroleum Co. Liquefied pet gas fuel system for I.C. engines. J. M. S.

SAFETY PRECAUTIONS

551. Toxicity of laboratory materials. Anon. *Oil Gas J.*, 28.12.53, **52** (34), 73.—A short list is given of chemicals normally to be found in a petroleum laboratory with their threshold toxicity limits and amount required for 1000 cu. ft. G. A. C.

MISCELLANEOUS

552. Cost of crude oil. R. J. Gonzales. *J. Petrol. Tech.*, May 1953, **5** (5), 23–5.—U.S. petroleum consumption is about 2 gal per person per day. The products average in cost 17 c per gal delivered. Natural gas consumption is equivalent to about half of this in weight and heat value. A study of wholesale price trends, 1913–52, shows that since 1926 the index of crude oil prices has been below that of all commodities. There is relatively little evidence in the past 40 years of any upward trend of the real cost of crude oil measured in terms of wholesale prices of all commodities. The number of hours' pay of manufacturing employees required to equal the price of a barrel of crude fell from 3·3 in 1913 to about 2 in 1928, and about 1·5 in 1951, 1947, and 1952. The work to buy 10 gal of gasoline was 5 hr in 1919, 2·5 hr in 1931–36, 1·3 hr in 1946, and 1·25 hr now.

The above trends have developed in spite of a series of factors tending to increase the difficulties of finding and producing oil. Wider spacing and good management have offset the tendency towards higher costs. From 1859 to 1925 nearly 700,000 wells were completed, developing reserves under 20,000 brl per well; from 1926 to 1951 a similar number of wells developed over 80,000 brl per well.

There is no evidence that conservation has been used as a means of price fixing. G. D. H.

553. Preparing preliminary job estimated. W. W. Bond. *Oil Gas J.*, 14.12.53, **52** (32), 106.—Charts are given for rapid estimating of preliminary costs within an accuracy of 20%. When a flow sheet only is available, process equipment can be costed from the charts, and various percentages of these costs are applied to calculate piping, insulation, instrumentation, etc. If proposed equipment is similar to that existing, cost is obtained by applying exponential factors. G. A. C.

554. A review of the British Iranian oil controversy. W. J. Levy. *Petrol. Times*, 8.1.54, **58** (1472), 19.—Importance of Iranian oil to the U.K., issues preceding nationalization, the Nationalization Law, U.S.–Iranian relations 1951–53, general problems, past proposals, and present prospects are dealt with in this Middle East Institute, Washington, sponsored review.

G. A. C.

555. Progress Review No. 28. Refractories 1950–1953. A. E. Dodd. *J. Inst. Fuel*, Dec. 1953, **26** (155), 312.—The most notable advances in the field of refractories in the last 4 years are, in the author's opinion, progress in refractories for the iron and steel industry and development of new highly specialized refractories. Other useful research was done on refractories for use in the gas industry, glass-tank furnaces, marine boilers, etc. Much work is also being carried out on refractory materials able to withstand very high temp. 16 literature refs.

D. K.

556. The fuel industries and atomic energy—some common interests. J. M. Hutcheson. *J. Inst. Fuel*, Dec. 1953, **26** (155), 306.—A study was made of boron in coal and petroleum derivatives used as raw materials in the graphite industry. The physical properties of graphite are affected by the shape of the coke particles used in its manufacture, and the effect of different grinding conditions on variations in shape are being made at Harwell. The atomic-energy industry is regarded as fuel consuming and fuel producing, and the effect of such developments as breeder reactors is discussed. D. K.

557. Petroleum prospecting in France, North Africa, and (French) overseas territories. J. Garantier. *Chim. et. Indust.*, 1953, **70**, 115–21.—Indigenous production supplies only 2% of France's requirements. Companies operating, their financial background, and their exploration, drilling, and production activities are listed; total production of crude, natural gas, and CHG for 1946–53 (Apr.) is tabulated. 1953 changes in company taxation will facilitate investment in petroleum prospecting. Protective customs tariff of 3000 francs/ton for indigenous crude is envisaged. V. B.

BOOK REVIEW

The Science of Petroleum Vol. 5—Pt. II. Synthetic Products of Petroleum. London: Oxford University Press, 1953. Pp. 329. 100*s*. net.

This new volume of the series, edited by two well-known petroleum experts, covers the fields of synthetic products and refinery processes. The former section includes the new developments in polymerization for motor gasoline manufacture, which are shown to reduce catalyst usage. The major part of the section is, however, devoted to the more complicated petroleum polymers, chemicals for synthetic rubbers, organic chemicals from natural gas, synthetic detergents, and carbon black. This series of articles is wholly new to the "Science of Petroleum" and contains information not previously collected together.

In the second section, comprising two-thirds of the volume, most of the established refinery processes are represented in a series of authoritative articles. The five articles on distillation cover theoretical considerations, process and equipment design; in these there is a tendency for the different authors to overlap each other, particularly in that each presents his own views on the theoretical considerations. The general approach to the subject is much better than the treatment in Vol. II, and the specialized articles on extraction and azeotropic distillation and hypersorption are noteworthy.

The mercaptan removal and sweetening processes are dealt with in several well-balanced articles. The lubricating oil processing section, however, is only covered by one article on extraction and dewaxing, which is too general to be of real value; no mention is made of propane de-asphalting, which has been improved considerably since the multi-stage and asphalt washing process described in Volume III.

The three metallurgical articles covering behaviour of steel in refinery practice are particularly praiseworthy and informative; these articles cover experience at high temperatures (1500° F), as employed in the butadiene process, and low temperatures as well as most of the more general refinery applications.

The experts in the several commercial catalytic processes have all presented excellent accounts of their respective processes, together with correlations of variables and yield data; it is of interest to note that yields for the same crude oils are given, which enables direct comparisons of the processes to be made.

The combined section on hydrogenation and dehydrogenation contains no article on hydrogenation, the art of which has made considerable strides since 1937.

Through no fault of the editors and authors, the articles on hydroforming (static bed) and catalytic dehydrogenation seem strangely out-of-date following the spate of new catalytic reforming processes based on platinum, and the advent of fluid hydroforming. The catalytic dehydrogenation article overlaps the excellent section on chemicals for synthetic rubber, which discusses the production of butenes, butadiene, and styrene. The dangers of prophesy in the petroleum industry are well illustrated, since the author indicates that "the use of platinum catalysts is not practicable in petroleum technology."

Excellent presentations are made of the chemistry of the several alkylation processes based on sulphuric acid, hydrofluoric acid, and the use of aluminium halide. Except in the case of hydrofluoric acid alkylation, however, plant design and operating data are not adequately covered. The sulphuric acid alkylation article gives information on the effect of the process variables on the yield and quality.

The printing, format, and binding are a credit to the Oxford University Press, and the publication of the new volumes in parts avoids the bulk of the earlier volumes.

J. W. H.

ADDITIONS TO THE LIBRARY

Symporium on Chemical Analysis of Inorganic Solids by Means of the Mass Spectrometer. Philadelphia, Pa.: ASTM, 1953. Pp. 40. $1.25.

Report of a meeting held by ASTM Committee E-2 at Atlantic City in 1951. The three papers deal with the use of the mass spectrometer for the determination of trace element impurities in solid samples, with the analysis of solids with the high-frequency spark, and with analysis of copper for cuprous-oxide rectifiers.

Geologic Aspects of Radio Wave Transmission. M. W. Pullen. Illinois State Geological Survey. Report of Investigations No. 162. Urbana, Ill.: State Geological Survey, 1953. Pp. 73.

A preliminary investigation of features that affect radio field intensity in the ground-wave area at standard broadcast frequencies.

Radiation Suppressing Coatings for Metals at Elevated Temperatures. A. H. Sulley, E. A. Brandes, and R. B. Waterhouse. Fulmer Research Institute Special Report No. 1. Stoke Poges, Bucks., The Institute, 1953. Pp. 24. 15*s*. net.

The work reported was designed to develop a refractory coating for gas turbine alloys. The results show that the coatings formulated can reflect a high proportion of incident radiation and can withstand considerable vibration and thermal shock without loss of adhesion.

Pilot Plant Catalytic Gasification of Hydrocarbons. C. H. Riesz, P. C. Lurie, C. L. Tsaros, and E. S. Pettyjohn. Institute of Gas Technology Research Bulletin 6. Chicago, Ill.: The Institute, 1953. Pp. 44. $5.00.

Hydrocarbons gasified included natural and refinery gas, propane, butane, gasoline, kerosine, crude naphtha, and light gas oil. Cracking these to produce a low heat value gas for subsequent enrichment with natural gas or propane is shown to be a means of providing substitutes of supplements for utility systems.

Viscosities of Natural Gas Components and Mixtures. N. L. Carr. Institute of Gas Technology Research Bulletin 23. Chicago, Ill.: The Institute, 1953. Pp. 59. $5.00.

Absolute viscosities of methane and of three natural gas mixtures were determined at pressures up to 10,000 p.s.i. in the range 70° to 250° F. The results are summarized and discussed, equipment and procedures are dealt with, and an extensive literature survey is provided. Results are also tabulated.

British Standards:

BS 974: 1953. Symbols for Use in Flow Diagrams of Chemical and Petroleum Plant. Pp. 17. 3*s*. 6*d*. net, post free.

In all 65 symbols are given and their use indicated. This is a revision of the standard first issued in 1941.

BS 2040 : 1953. Bitumen Macadam with Gravel Aggregate. Pp. 18. 3*s*. net, post free.

This standard covers the manufacture and laying of mixtures of gravel aggregate with bitumen or with bitumen and lake asphalt mixtures for base course, single course, and three textures of wearing course.

BS 2049 : Part 1 : 1953. Kerosine (Paraffin) Appliances for Domestic Use. Pp. 31. 10*s*. net, post free.

The appliances include burners, portable space heaters, cooking and boiling appliances. Details and drawings are included, and methods of test are described.

BS 308 : 1953. Engineering Drawing Practice. Pp. 81. 10*s*. 6*d*. net, post free.

BS 458 : 1953. Xyloles. Pp. 37. 7*s*. 6*d*. net, post free.

BS 558 and 564 : 1953. Nickel Anodes and Nickel Salts for Electroplating. Pp. 26. 4*s*. net, post free.

BS 691 : 1953. Clinical Maximum Thermometers. Pp. 8. 2*s*. net, post free.

BS 701 : 1953. Brewers' Mash Flask. Pp. 8. 2*s*. net, post free.

BS 784 : 1953. Methods of Test for Chemical Stoneware. Pp. 19. 3*s*. net, post free.

BS 1157 : 1953. Tapping Drill Sizes. Pp. 20. 3*s*. 6*d*. net, post free.

BS 1224 : 1953. Electroplated Coatings of Nickel and Chromium. Pp. 14. 2*s*. 6*d*. net, post free.

BS 1580 : 1953. Unified Screw Threads. Pp. 101. 12*s*. 6*d*. net, post free.

BS 1916 : Part 2 : 1953. Guide to the Selection of Fits. Pt 1. Limits and Fits for Engineering. Pp. 50. 9*s*. 6*d*. net, post free.

BS 2045 : 1953. Preferred Numbers. Pp. 10. 2*s*. 6*d*. net, post free.

BS 2054 : 1953. Augers and Auger Bits. Pp. 21. 4*s*. net, post free.

BS 2060 : 1953. Copper Alloy Globe Valves for General Purposes. Pp. 19. 4*s*. net, post free.

API Standards :

Std. 6B, 5th Ed., Sept. 1953. Ring-Joint Flanges for Drilling and Production Service (Tentative). 75 cents.

Sup. 1, to Std. 6E, 3rd Ed., May 1953. Wellhead Equipment.

Std. 7, 11th Ed., April 1953. Rotary Drilling Equipment. $1.25.

Std. 8B, 6th Ed., Sept. 1953. Internal-Combustion Engines and Unit-Type Radiator Coolers for Oilfield Service. $1.00.

RP 8C, 1st Ed., May 1953. Recommended Practice for Installation, Maintenance, and Operation of Internal-Combustion Engines (Tentative). 75 cents.

Std. 12B, 6th Ed., Sept. 1953. Bolted Tanks. 75 cents.

Sup. 1 to Std. 12C, 11th Ed., Sept. 1953. Welded Oil Storage Tanks.

RP 50A, 3rd Ed., April 1953. Recommended Practice for Measuring, Sampling, and Testing Natural Gas. 75 cents.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

558. Use of photogeology in the search for oil. J. Krebs. *Bull. Ass. franç. Tech. Pétrol*, July 1953, **31**, 25–32.—The principles used in preparing photogeological maps from aerial photographs are briefly described. It is shown how a morphological and structural map can be rapidly prepared in this way, while conventional ground surveys would be slow, and would not so readily show important features. G. D. H.

559. Spraberry structural conditions. Pt 2. G. F. Warn. *World Oil*, Apr. 1953, **136** (5), 100.—Several types of fractures occur in the Spraberry trend. These include flat vertical breaks; curving vertical breaks; helical breaks; and small intersecting vertical breaks.

Forces producing these fractures could have been tensional, compressional, shearing, or torsional. However, fracture patterns do not support the idea of failure under shearing or compression, neither are tension breaks due to volume loss apparent.

The original dips or trends of the fractures could have been altered under repeated deformation, but the tectonic history of the area does not support this view. W. S. R.

560. Black Warrior basin—the geology is favourable. Pt 2. F. F. Mellen. *World Oil*, July 1953, **137** (1), 97.—The stratigraphy of the area is described in great detail. Although complex, both stratigraphy and structure are conducive to the accumulation of oil.

Many faults, nearly all normal, have been mapped—showing in general a strike roughly normal to the axis of Appalachian folding. Grabens are also found where Chester sediments have been dropped into Lower Mississippian cherty limestones.

Every Palæozoic system represented in the basin has shown some porosity and has yielded showings of oil and gas.

Mississippian and Pennsylvanian strata are commonly asphaltic on the outcrop, whilst in wells the quality ranges from asphalts to oils of 35°–40° API.

Many reservoirs contain sufficient salt water and permeability to afford effective water-drive. W. S. R.

561. Can Ellenburger be sub-divided? V. E. Barnes. *Petrol. Engr*, May 1953, **25** (5), B104.—The Ellenburger is a thick series of L. Orovician carbonate rocks which includes limestone as well as dolomite. The formation is found in central Texas and also in the Arbuckle Mountains, where it is known as the Arbuckle Limestone.

It is important to know which part of the Ellenburger is being reached when drilling for oil—many wells are abandoned if oil is not found in the first 100 ft of the formation.

Research being carried out to distinguish the individual characteristics of the various portions of the Ellenburger includes the use of such techniques as thermoluminescence, spectrochemical analysis, X-ray, and differential thermal analysis of the clay minerals.

Research is expected to take 3 years. W. S. R.

562. What are the opportunities in the Illinois Basin? W. E. Brubeck. *World Oil*, May 1953, **136** (6), 111.—Geology of the area is simple because of the uniformity of beds, formations scarcely varying in thickness for 30 miles or more. There are no unconformities, lap-outs, or reefing, whilst zones of minor faulting are well defined.

Accumulations appear to result from gentle structural flattenings, accompanied by stratigraphic traps. In some cases sand lenses have been found productive without any structural flattening. It would appear that oil has originated in shale beds, been squeezed out into the sand lens, and trapped as the sand wedges out up-dip.

The economics of exploration in this area are also discussed in detail. W. S. R.

563. Late pre-Cambrian and early Paleozoic geology of western Uinta Mountains, Utah. N. C. Williams. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2034.—Data have been collected by geologic mapping in the South Fork Basin of the western Uinta Mountains which permit a more accurate interpretation of the position of the pre-Cambrian–Paleozoic contact.

This paper describes 2 formations, Ophir and Pine Valley, which have hitherto been assigned to the Cambrian, but are now discovered to be separated by a 20° angle of discordance. Other lithic units have been recognized as distinctive formations in the upper pre-Cambrian sequence, and names and correlations proposed.

It is stated that the Madison formation (Lower Mississippian) was deposited upon an erosional surface composed largely of pre-Cambrian strata, partly of Cambrian strata, and locally of fossiliferous strata of Devonian age, and accordingly, a pre-Madison period of uplift and erosion is postulated.

E. N. T.

564. Structural analysis of Delta Farms field, Lafourche Parish, Louisiana. A. L. Morgan. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2649.—This paper presents a structural analysis of the Delta Farms field, which is near the centre of Lafourche Parish, in a small petroliferous area containing many major oilfields.

A description is given of the structural conditions underlying and causing this oil reserve which are due to 2 elongate domes or ridges on opposite sides of the field; these structures appear to be related to the movement of salt as well as to long-continued basinward slump faulting.

During the entire depositional sequence faulting was active and materially affected the distribution of hydrocarbon reservoirs, the shape of the structure, and the thickness of material deposited. A section is shown of bathyal Miocene, neritic Miocene, continental Miocene–Pliocene, neritic Pleistocene, and continental Pleistocene to Recent. E. N. T.

565. Subsurface geology of South-Central Anadarko basin, Oklahoma. R. P. McNeal. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2677.—The work described was undertaken to learn the stratigraphy and structure of this area, which extends from the steep south flank to the gentle north flank of the Anadarko basin, as no detailed paper has previously been published on this region.

The stratigraphy and tectonics are related to the orogeny of the Wichita Mountains, and normal marine beds were deposited from Arbuckle through Springer time.

The arkosic material forming reservoir beds accounts for most of the production in the area, and these sediments, which fingered into marine beds on the north, came from the mountains of Atoka and Wellington time.

The largest field under discussion, the Elk City field, is shown to be on a small closure in the trough, and structure maps of younger beds show that the syncline gradually expanded until in Wellington time the field was incorporated within it. E. N. T.

566. Oilfields of Mercedes region, Venezuela. J. M. Patterson and J. G. Wilson. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2705.—The Mercedes, Palacio, and Guavinita oilfields are located in the north-central part of the state of Guárico, which is situated near the western end of the eastern Venezuelan geosyncline.

In June 1953, 72 reservoirs were productive in this area, and during the first 6 months of 1953, 24,340 b.d. were produced, from formations of Cretaceous and Oligocene age.

The Cretaceous, represented by the Temblador group, is now subdivided into 4 new formations, the thickness varying from zero to over 2500 ft. The Oligocene overlaps the Cretaceous, and is represented by the La Pascua, Roblecito, and Chaguaramas formations. The Chaguaramas formation is now truncated by erosion, and although incomplete, projection of rates of thickening suggests that the original thickness was as great as 14,000 ft in the present foothills zone.

E. N. T.

567. Photogeology and its use in prospecting on the Saharan concessions of C.R.E.P.S. P. Michel. *Bull. Ass. franç. Tech. Pétrol*, July 1953, **31**, 15–24.—Marine Cambrian to topmost Carboniferous beds were known to have been deposited on the pre-Cambrian of Hoggar. Gothlandian shales of the order of 300 m thick appear to be potential source rocks, and are bituminous at points. Other shaly horizons in the Carboniferous and Upper Devonian might also be source rocks. Reservoir rocks are known in the sandstones of the Lower Devonian, while there are others in the Middle and Upper Devonian and Carboniferous. Cover rocks are also known in these groups. No oil shows were known. Even though oil formation was not proved, it seemed worth while to make structural studies. This was done, together with the preparation of topographic maps, by means of aerial photographs. 110,000 km² was covered by photography, yielding a scale of about 1/55,000, and 7 months sufficed for this. The maps showed the main structures and the sites of outcrops, together with the best means of access. Geological parties spent 6 months investigating the most favourable area covering about 25,000 km². The cost may be about 1900 fr/km², only a third or a quarter of the probable cost without aerial photography, and completed 3 times more quickly.

The Fort Flatters–Fort Polignac area of 85,000 km² is to be similarly surveyed. G. D. H.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

568. Geophysical activity reaches all time high in 1952. E. A. Eckhardt. *World Oil*, Apr. 1953, **136** (5), 82.—The full-time services of 905 crews were utilized the world over, an increase of 114 crews over 1951.

Figures at hand indicate a slight decrease in gravity operations, no figures being available for other types of survey.

Exploration results appear to have fallen well below the preliminary estimates, the net addition to reserves being only 750,000 million brl. W. S. R.

569. New gravity approach aids reef interpretation. R. A. Pohly. *World Oil*, May 1953, **136** (6), 116.—Work in West Texas revealed that max anomalies were narrower and the curvatures greater on the observed profiles than on the computed curves when the reef anomaly was predominantly max, and that flanking minima were invariably present. When the reef produced a minimum anomaly, profiles compared favourably except for a narrow max tendency in the centre.

A typical empirical anomaly, with a central max and surrounding minimum, was adopted to aid interpretation. Use of this method has proved very satisfactory.

Any empirical gravity anomaly must have a plausible explanation in terms of mass distribution in the sub-surface—in the reef problem it would appear to be due to variation in relative densities of the components of the reef complex.

The author suggests, on a theoretical basis, a mass distribution which fits observed anomalies and also has some support from limited core density and seismic velocity studies.

The reef is divided into 4 zones, each zone is described, and its contribution to the anomaly analysed. W. S. R.

570. New seismic computing method fast and efficient. R. B. Rice. *World Oil*, Aug. 1953, **137** (2), 93.—A time resolution method of performing reflection seismograph computations has been developed in the Mid-Continent. The method is essentially based on the resolution of seismic data in time units rather than distance units.

Advantages of the method include: (1) simplicity; (2) allows the use of any desired velocity gradient or the rapid change from one velocity function to another.

The author describes the derivation of the formulæ concerned, and also illustrates the use of the method. W. S. R.

571. The calibration of gamma ray logs. A. Blanchard and J. T. Dewan. *Petrol. Engr*, Aug. 1953, **25** (8), B76.—Means have been found to calibrate γ-ray logs in terms of actual formation radio-activities, expressed as the number of micrograms of radium-equivalent per ton of formation. Departure curves are presented which permit correction for the absorption due to mud, casing, and cement in the borehole.

This calibration should aid not only in the newer uses of γ-ray curves but also in well-established methods of sub-surface correlation. W. S. R.

572. Methods and advantages of determining gravities of crude in oil bearing rock samples. J. O. Nigra. *Petrol. Engr*, Aug. 1953, **25** (8), B65.—Methods are described by which the sp. gr. of minute quantities of crude, such as could be extracted from wire-line cores, can be determined within reasonable limits of accuracy. The methods used include the water–alcohol suspension method and the refractometer method. The latter method involves establishing a local relationship between refractive index and sp. gr. A tentative conversion graph utilizing the linear relationship between these properties is included.

The relative advantages of determining oil gravities from cores are discussed. It is suggested that pre-production knowledge of petroleum grading is very necessary to assist in well completion and refinery operation. W. S. R.

573. Chemical characteristics of waters from the Canyon, Strawn, and Wolfcamp formations in Scurry, Kent, Borden, and Howard counties, Texas. W. C. Elliot, Jr. *Petrol. Engr*, June 1953, **25** (6), B77.—Purpose of the investigation was to determine the characteristics of different formation waters and their variation from area to area. Information was also required to determine the chemical compatibility of injected water with interstitial water—to prevent deposition of salts that might plug capillaries and reduce the permeability of the formation.

The Palmer system of water classification was extensively used, standard analysis methods also being used, mineral constituents being reported in ionic form as parts per million.

Because there is a similarity in the characteristics of all the waters of this area, other analytical means were used to distinguish the waters. Ionic ratios were calculated to illustrate the relationship of the reacting capacities of several radicals.

Water samples obtained from wells after acidization showed abnormal changes.

Results of the survey are tabulated. W. S. R.

574. Patents. U.S.P. 2,645,752 (9.3.51; 14.7.53). C. R. Glanville, H. F. Dunlop, and E. W. Shuler, assrs to Atlantic Refining Co. Method of determining the resistance factor of an earth formation comprising forming a cyl of fluid-impervious, electrically insulating material around cuttings from the formation, removing material from the ends of the cyl to expose a face of each of the cuttings, saturating the cuttings with brine soln, and measuring the resistance to flow of electric current through the cyl.

U.S.P. 2,651,756 (11.9.50; 8.9.53). M. E. Morrow, assr to Midwestern Geophysical Laboratory. Oscillograph galvanometer.

U.S.P. 2,651,769 (1.8.52; 8.9.53). J. A. Stafford, assr to Century Geophysical Corpn. Seismic vibration detector.

U.S.P. 2,652,550 (23.2.49; 15.9.53). C. C. Lash, assr to Stanolind Oil and Gas Co. Marine seismometer spread.

U.S.P. 2,652,558–62 (12.1.50, 7.11.50, 8.9.51, 6.11.51, 20.11.51; 15.9.53). J. E. Hawkins, assr to Seismograph Service Corpn. These patents relate to wave signal transmission systems.

U.S.P. 2,653,305 (10.6.49; 22.9.53). E. L. De Shazo, assr to Phillips Petroleum Co. Apparatus for measuring the polarity of seismometers.

U.S.P. 2,653,306 (3.10.49; 22.9.53). R. G. Piety, assr to Phillips Petroleum Co. Capacitive seismometer.

U.S.P. 2,653,990 (21.3.51; 29.9.53). A. A. Brant, assr to Newmont Mining Corpn. Tubing arrangement for insertion in a drill hole for making geophysical explorations.

U.S.P. 2,654,077 (6.4.50; 29.9.53). K. W. McLoad, assr to Socony-Vacuum Oil Co. Multiterminal seismic cable connector system. J. M. S.

DRILLING

575. Exploration drilling remains well ahead of 1952 pace. C. W. Smith. *World Oil*, Apr. 1953, **136** (5), 120.—1843 exploratory tests have been completed so far this year, compared with 1626 for a similar period last year. February's results included 77 new oil finds and 25 new pay levels, as well as 32 natural gas and diat discoveries. All-round results are higher than last year.

Results are tabulated by districts for Feb. and the first 2 months of the year. W. S. R.

576. Drilling with gas. R. Rivoire. *Bull. Ass. franç. Tech. Pétrol*, July 1953, **31**, 127–38.—The presence of gas in the Lower Cretaceous at Cap Bon, and the presence of liq shows at Zaouia led to drilling on the Oued Bahloul structure between the 2 areas in central Tunis. The drilling and testing of 2 wells on this structure is described. In the first well gas, water, and traces of oil were met. There was loss of circulation at several points, and invasion prevented the clear fixing of fluid levels. The second well was planned to meet the formation near the presumed gas–oil contact, so reducing certain difficulties, including loss of circulation. A part of the section was drilled dry, or with gas and reversed circulation. The equipment for the latter operation is described. The rock reached the surface as fine powder, and a gas–water contact was detected in the dolomite. Due to the low pressure gas circulation was stopped by water influx. Data are given on drilling speed and core recovery when drilling dry, with mud or with gas. G. D. H.

577. Patents. U.S.P. 2,644,242 (28.2.49; 7.7.53). J. C. Hewitt. Direction-indicating instrument for well surveying.

U.S.P. 2,644,401 (15.3.51; 7.7.53). D. Ragland, assr to Standard Oil Development Co. Apparatus for pumping drilling fluids.

U.S.P. 2,644,519 (11.9.50; 7.7.53). W. E. Kanady, assr to Standard Oil Development Co. Gun for perforating casing in an oil well below tubing suspended in the casing.

U.S.P. 2,644,523 (12.3.49; 7.7.53). C. C. Brown. Method of connecting well casing (I) to a liner (II) in a well bore (III) comprising lowering I into III into axial alignment with II and axially spaced from the upper end of II, sealing the upper end of the bore of II against the entrance of fluids, introducing cement slurry into III surrounding the adjacent ends of I and II, lowering I into end abutting engagement with II, allowing the cement slurry to harden, and removing the seal.

U.S.P. 2,644,524 (4.11.46; 7.7.53). R. C. Baker, assr to Baker Oil Tools Inc. Tubing and well tool coupling.

U.S.P. 2,644,525 (24.2.47; 7.7.53). F. H. Lee, assr to Baker Oil Tools Inc. Well cementing apparatus.

U.S.P. 2,644,526 (4.4.47; 7.7.53). F. H. Lee, assr to Baker Oil Tools Inc. Casing collar for cementing wells.

U.S.P. 2,644,528 (14.7.47; 7.7.53). T. M. Ragan, assr to Baker Oil Tools Inc. Booster device for operating well tools.

U.S.P. 2,644,529 (20.9.48; 7.7.53). R. C. Baker, assr to Baker Oil Tools Inc. Cushioned gas-operated well apparatus.

U.S.P. 2,644,530 (20.9.48; 7.7.53). R. C. Baker, assr to Baker Oil Tools Inc. Gas-operated well apparatus with expansion retarding device.

U.S.P. 2,644,670 (30.10.50; 7.7.53). J. R. Baker and E. H. Clark, assrs to Baker Oil Tools Inc. Expansible drill bit and cutter blade.

U.S.P. 2,644,671 (4.3.47; 7.7.53). M. D. Ingram. Rock bit for rotary drilling.

U.S.P. 2,644,672 (29.1.51; 7.7.53). T. C. Mathews. Diamond bit with malleable protector. The protector covers the bit during descent into the well bore, and is compressed between the bit and the bottom of the well bore, thereby flowing around and embedding debris. On rotation of the bit the protector is stripped off and ground up with the debris and discharged from the bore.

U.S.P. 2,644,673 (26.9.49; 7.7.53). J. R. Baker, assr to Baker Oil Tools Inc. Expansible rotary drill bit and cutter.

U.S.P. 2,644,791 (Netherlands 16.3.50; 7.7.53). J. van Heiningen, assr to Shell Development Co. Drilling fluid comprising an oil-containing suspending liq. an oleophilic asphaltic bitumen plastering agent, and oil shale.

U.S.P. 2,644,891 (28.3.50; 7.7.53). G. Herzog, assr to Texas Co. Neutron borehole logging.

U.S.P. 2,645,027 (9.6.47; 14.7.53). H. J. Eastman and J. G. Jackson, assrs to Eastman Oil Well Survey Co. Well caliper with means for photographic recording.

U.S.P. 2,645,207 (12.4.48; 14.7.53). R. Bassinger. Percussion drilling tool.

U.S.P. 2,645,454 (7.10.49; 14.7.53). I. C. Nourse, assr (in part) to Shirley Johnson. Auxiliary jack assembly for lifting a polish rod extending above the upper end of a well tubing.

U.S.P. 2,645,456 (28.11.50; 14.7.53). V. Thompson. Wedge-level reamer for wedging-off a branch hole.

U.S.P. 2,645,457 (3.7.50; 14.7.53). J. W. Houston. Drilling apparatus.

U.S.P. 2,645,458 (29.7.50; 14.7.53). M. Yost. Drilling rig.

U.S.P. 2,645,459 (6.8.51; 14.7.53). W. N. Sutliff. Hydraulic well jar.

U.S.P. 2,645,723 (21.2.46; 14.7.53). R. E. Fearon, assr to Well Surveys Inc. Ionization chamber circuit for increasing speed of well logging.

U.S.P. 2,645,767 (26.1.51; 14.7.53). P. M. Green, assr to Socony-Vacuum Oil Co. Electromechanical interval timer for well logging.

U.S.P. 2,646,124 (15.10.51; 21.7.53). J. L. Strickler. Means for sealing a well casing in a borehole.

U.S.P. 2,646,125 (29.11.46; 21.7.53). J. E. Hall, assr in part to Parker Industrial Products Inc. Apparatus for multistage cementing of deep wells.

U.S.P. 2,646,126 (18.8.50; 21.7.53). G. D. Goodner. Well screen.

U.S.P. 2,646,128 (18.10.48; 21.7.53). J. M. Reynolds. Drilling equipment of the cable tool type.

U.S.P. 2,646,129 (12.2.48; 21.7.53). J. M. Dunn. Method of drilling wells in water bearing quicksand.

U.S.P. 2,646,249 (18.9.48; 21.7.53). J. F. Medearis. Installing tool for applying a tubular cyl casing protector to a drill pipe.

U.S.P. 2,646,252 (11.4.50; 21.7.53). H. E. Hylbak, assr to the U.S.A. (Atomic Energy Commission). Device for obtaining soil samples from the side walls of wells encased in pipe.

U.S.P. 2,646,253 (3.1.50; 21.7.53). D. S. Johnston, assr to Signal Oil and Gas Co. Drilling deviated boreholes.

U.S.P. 2,646,254 (2.9.50; 21.7.53). D. S. Johnston, assr to Signal Oil and Gas Co. Method of controlling deviation in drilling boreholes.

U.S.P. 2,646,255 (29.8.51; 21.7.53). B. J. Bowman. Revolving spud line for cable tool drills.

U.S.P. 2,646,360 (29.8.49; 21.7.53). P. J. Lea, assr to Phillips Petroleum Co. Cement capable of forming an aq slurry when mixed with water, consisting of hydraulic cement, 0·1–3% wt of an alkali metal, alkaline earth metal, magnesium or ammonium lignin sulphonate, and 0·05–3% wt of an alkali metal salt or hydroxide.

U.S.P. 2,646,680 (19.12.47; 28.7.53). B. R. Steele and W. E. Nolan. Device for indicating conditions in well bores.

U.S.P. 2,646,846 (4.12.50; 28.7.53). H. G. Cutforth, assr to Phillips Petroleum Co. Well cement made by mixing 0·1–3·0% of a water-soluble alkali metal polyvinyl sulphate with hydraulic cement and slurrying with water.

U.S.P. 2,646,962 (19.2.47; 28.7.53). G. P. Wagner, assr to Engineering Development Co. Oil well drilling turbine.

U.S.P. 2,647,008 (10.8.50; 28.7.53). L. E. Stewart and M. J. Winters, assrs to Tri-State Oil Tool Co. Retrieving arrangement for well drilling operations.

U.S.P. 2,650,539 (23.8.47; 1.9.53). H. M. Greene. Apparatus for opening apertures in the wall of a well bore.

U.S.P. 2,650,546 (11.3.47; 1.9.53). H. J. Pankratz, assr to Phillips Petroleum Co. Swab for use in pipe of varying dia in a well.

U.S.P. 2,650,664 (23.4.51; 1.9.53). L. S. Sorensen. Liner hanger.

U.S.P. 2,650,796 (9.2.48; 1.9.53). J. G. Abraham, assr to National Supply Co. Draw-works feed control for rotary drilling rig.

U.S.P. 2,650,797 (20.3.50; 1.9.53). K. R. Stohn. Combination bumper and safety joint unit for inserting between portions of a drilling string.

U.S.P. 2,650,798 (22.10.49; 1.9.53). K. R. Stohn. Key seat tool for well drilling.

U.S.P. 2,650,905 (1.3.50; 1.9.53). R. G. Fordyce and M. Baer, assrs to Monsanto Chemical Co. Drilling mud containing a sulphonated polystyrene.

U.S.P. 2,651,027 (1.10.49; 1.9.53). C. B. Vogel, assr to Shell Development Co. Apparatus for generating acoustic waves in a well bore.

U.S.P. 2,651,181 (20.8.48; 8.9.53). J. W. Alcorn and D. F. Dial, assrs to Pure Oil Co. Apparatus for the erection of a structure of driven piles in a sea or river bed.

U.S.P. 2,651,198 (31.1.46; 8.9.53). J. T. Hayward. Weight-on-bit registering device for earth drilling apparatus.

U.S.P. 2,651,199 (2.8.46; 8.9.53). C. P. Collins and C. A. Brokaw, assrs to Eastman Oil Well Survey Co. Protective guide device for well instruments.

U.S.P. 2,653,474 (1.7.46; 29.9.53). J. J. Santiago, assr to Grant Oil Tool Co. Apparatus for determining well pipe perforations.

U.S.P. 2,653,666 (21.3.49; 29.9.53). R. C. Baker, assr to Baker Oil Tools Inc. Dump bailer and bridge plug.

U.S.P. 2,653,794 (25.4.49; 29.9.53). D. E. Straitiff. Well digging device.

U.S.P. 2,653,796 (20.5.48; 29.9.53). D. A. McGee and T. Seale, assrs to Kerr-McGee Oil Industries Inc. Oil well drilling rig.

U.S.P. 2,654,064 (28.8.50; 29.9.53). R. A. Broding, assr to Socony-Vacuum Oil Co. Electrical resistivity logging of mud invaded formations.

U.S.P. 2,651,367 (12.1.48; 8.9.53). R. C. Baker, assr to Baker Oil Tools Inc. Plug device for well conduits.

U.S.P. 2,651,368 (23.4.48; 8.9.53). R. C. Baker and B. L. Austin, assrs to Baker Oil Tools Inc. Plug and valve device for casing apparatus.

U.S.P. 2,651,369 (25.2.52; 8.9.53). G. F. Abendroth, G. H. Tausch, and J. Ward, assrs to Standard Oil Development Co. Gravel packing apparatus and method for arranging same in well casings.

U.S.P. 2,651,371 (27.9.48; 8.9.53). L. W. Toelke. Well plugging device.

U.S.P. 2,651,499 (18.7.51; 8.9.53). J. A. Zublin. Apparatus for drilling curved deviating bores from existing vertical well bores.

U.S.P. 2,651,500 (4.5.48; 8.9.53). C. F. Teichmann, assr to Texaco Development Corpn. Drilling mud containing added carbohydrates or proteins is caked on the walls of a borehole and the mud cake is inoculated with bacteria of the Clostridium genus. The bacteria metabolize the carbohydrates or proteins to soluble products to leave the mud cake permeable.

U.S.P. 2,651,501 (15.2.51; 8.9.53). R. D. McMahon. Rotary drill bit.

U.S.P. 2,652,117 (16.6.50; 15.9.53). H. S. Arendt and G. F. Abendroth, assrs to Standard Oil Development Co. Method and apparatus for gravel packing wells.

U.S.P. 2,652,118 (25.7.49; 15.9.53). W. W. Hartman and R. A. Steps. Basket guide for mounting on a pipe and lowering into a well preparatory to cementing.

U.S.P. 2,652,119 (1.11.49; 15.9.53). S. R. Knapp. Hydraulically actuated fishing tool for reclaiming broken drill parts from wells.

U.S.P. 2,652,120 (20.12.49; 15.9.53). J. W. Hodges, assr to Sun Oil Co. Tool for removing fouling material from a well.

U.S.P. 2,652,160 (18.9.48; 15.9.53). B. P. La Mulle, assr to Texas Co. Device for attaching to a platform of a well derrick equipped with an elevator for engaging and lowering pipe stands into a well bore.

U.S.P. 2,652,232 (14.7.52; 15.9.53). H. H. Holland, assr to Standard Oil Development Co. Core barrel for use in a drill stem adjacent the drill bit.

U.S.P. 2,652,281 (2.10.50; 15.9.53). T. M. Hunt and T. L. Nichols. Drill rod fishing tool.

U.S.P. 2,652,496 (28.3.50; 15.9.53). G. Herzog and A. S. McKay, assrs to Texas Co. Radioactivity method and apparatus for borehole logging.

U.S.P. 2,652,717 (26.4.48; 22.9.53). W. M. Bush and C. H. Collett, assrs to Bush Testing Inc. Apparatus for testing tubing.

U.S.P. 2,652,894 (9.8.48; 22.9.53). C. C. Brown and F. L. Scott. Hold-down slip assembly for well packers.

U.S.P. 2,652,895 (16.2.50; 22.9.53). H. L. Arrowood, assr to Hinderliter Tool Co. Sealing device for well heads.

U.S.P. 2,653,006 (6.1.50; 22.9.53). R. W. Lewis, assr to Gem Oil Tool Co. Pipe lifter.

U.S.P. 2,653,007 (3.11.48; 22.9.53). H. P. Aston, assr to Sun Oil Co. Guide for orientating repeated drilling operations in a well borehole.

U.S.P. 2,653,008 (29.12.49; 22.9.53). E. L. Potts, assr to C. C. Brown. Well jar.

U.S.P. 2,653,009 (16.12.49; 22.9.53). D. Ragland, assr to Standard Oil Development Co. Combination stabilizer and hydraulic pack-off kelly joint.

U.S.P. 2,653,010 (24.3.48; 22.9.53). J. C. Curtis, assr to Joy Manufacturing Co. Percussive rock drill bit.

U.S.P. 2,653,294 (21.4.49; 22.9.53). F. L. McMillan, assr to Phillips Petroleum Co. Electrode structure for electric well logging.

U.S.P. 2,653,389 (3.5.48; 29.9.53). G. J. Butterworth and E. T. Young, assrs to Sperry-Sun Well Surveying Co. Well surveying instrument.

U.S.P. 2,653,452 (6.4.49; 29.9.53). R. A. J. Dawson. Deep water submersible barge. J. M. S.

PRODUCTION

578. Is packed height a variable in flooding? W. M. Newton, T. B. Metcalfe, and J. W. Mason. *Petrol. Refin.*, 1953, **32** (10), 125–8.—An account of experimental work on the variation in flooding velocity with packed ht, type of packing, and liq rate using water and air. At low liq rates increase in packed ht lowers the flooding velocity until a critical height is reached, further increase has no effect on the flooding velocity. This critical height is found to correspond to that required for even distribution of the liq. At high liq rates this height effect becomes negligible. R. D. S.

579. Patents. U.S.P. 2,637,276 (10.5.47; 5.5.53). C. J. Coberly, assr to Dresser Equipment Co. Fluid operated pumping system for wells.

U.S.P. 2,637,469 (26.10.48; 5.5.53). J. A. Clay. Mechanical apparatus to inject fluids into wells in batches.

U.S.P. 2,637,998 (14.11.46; 12.5.53). J. H. Ramser, assr to Atlantic Refining Co. Apparatus for determining well pressures.

U.S.P. 2,638,451 (31.1.50; 12.5.53). W. M. Hughes, assr to Cities Service Oil Co. Pet water-in-oil emulsions are broken by means of azolidine salts of alkylated naphthalene sulphonic acids.

U.S.P. 2,638,917 (6.9.50; 19.5.53). L. C. Clair. Reduction choke for oil and gas well systems.

U.S.P. 2,639,090 (13.10.49; 19.5.53). J. E. Sherborne, assr to Union Oil Co of California. Method of electrically representing a segment of an oil-bearing formation.

U.S.P. 2,639,674 (13.6.49; 26.5.53). R. H. Reese, assr to Fillmore Improvement Co. Oil well pump cleaner.

U.S.P. 2,639,774 (31.5.50; 26.5.53). L. H. Rhoads, assr to L. W. Feller. Oil delivery and paraffin removal system for wells.

U.S.P. 2,650,574 (4.8.47; 1.9.53). D. A. MacDonald. Fluid lift pumping equipment.

U.S.P. 2,651,370 (24.4.47; 8.9.53). J. M. Pearson, assr to Sun Oil Co. Borehole flowmeter.

U.S.P. 2,651,914 (28.2.50; 15.9.53). J. F. Joy, assr to Joy Manufacturing Co. Pumping head and operating mechanism for wells.

U.S.P. 2,652,000 (20.3.45; 15.9.53). S. W. Woolsey. Combination reservoir energy and pumping equipment control for well bores.

U.S.P. 2,652,130 (26.6.50; 15.9.53). C. K. Ferguson, assr to California Research Corpn. Gas-oil separator for the lower end of a well casing.

U.S.P. 2,652,231 (3.10.49; 15.9.53). R. A. Smith. Deep well pump-actuating assembly.

U.S.P. 2,652,360 (10.5.51; 15.9.53). D. C. Bond and R. H. Lorenz, assrs to Pure Oil Co. Siliceous earth formations are acidized with a mixture of hydrofluoric acid and an halogenated organic carboxylic acid.

U.S.P. 2,652,531 (12.9.49; 15.9.53). W. M. Schaufelberger, H. N. Herrick, and J. R. Leggett, assrs to California Research Corpn. Apparatus for determining magnetic properties of well cores.

U.S.P. 2,652,720 (15.11.48; 22.9.53). R. G. Piety, assr to Phillips Petroleum Co. Method of determining total flow in a borehole.

U.S.P. 2,652,779 (16.1.50; 22.9.53). R. F. McArthur, assr to Dresser Equipment Co. Fluid-operated free pump with packing device.

U.S.P. 2,653,545 (7.4.51; 29.9.53). O. E. Dempsey and J. B. Woods, assrs to Byron Jackson Co. Well installation for subsurface hydraulic pumps. J. M. S.

OILFIELD DEVELOPMENT

580. Exploratory drilling continues record breaking pace. C. W. Smith. *World Oil*, May 1953, **136** (6), 130.—Volume of exploratory drilling is about 9% greater than last year. During March 871 tests were made, of which 162 were commercial producers. Of these 162 producers, 108 were new oil pools.

In the first quarter of the year 2714 tests were made, of which 520 were producers.

Results are tabulated by districts. W. S. R.

581. Increase in activity sends exploratory completions up. C. W. Smith. *World Oil*, June 1953, **136** (7), 97.—888 exploratory drillings were completed during April. Of these 172 were completed as commercial producers. This figure includes 78 new oilfields and 34 new oil pay zones, whilst there were 15 dist and 20 gas discoveries.

Completions are still at a higher figure than for the same period last year.

Results are tabulated by districts. W. S. R.

582. Exploratory drilling continues upswing. C. W. Smith. *World Oil*, July 1953, **137** (1), 116.—Of 1010 tests completed during May there were 212 production tests. 163 were classified as commercial producers, including 116 new oilfields and pays, 17 dist, and 30 gas discoveries.

Continued increases in exploration are expected.

Results for May and the first 5 months of the year are tabulated by districts. W. S. R.

583. Exploratory drilling reaches new peak at mid-year. C. W. Smith. *World Oil*, Aug. 1953, **137** (2), 106.—At the end of June, exploratory wells completed numbered 5635—7·4% higher than last year. 1124 were producers compared with 998 for 1952.

Total discoveries in June were 175, of which 138 were oil, 16 dist, and 21 gas discoveries.

Results are tabulated by districts. W. S. R.

584. Quinduno field in Anadarko basin. C. C. Hemsell. *Petrol. Engr*, May 1953, **25** (5), B69.—Recent discoveries have added additional oil and gas potentialities to the south flank of the Anadarko basin in the Texas Panhandle. Similarities between the Quinduno and Elk City fields are apparent as both found oil and gas in the "granite wash" greywacke (Pennsylvanian). Both fields are the same distance from the Wichita–Amarillo Uplift axis, whilst there is also evidence of faulting between these fields and the uplift.

In the Quinduno field there are 9 wells completed in Wolfcamp dolomite (Permian) at about 4000 ft and one in the Pennsylvanian greywacke. The Wolfcamp is represented by 125–165 ft of dolomite and approx 1700 ft of very porous fossiliferous limestone. There is some evidence of shale partings.

Reservoir pressure in the Wolfcamp is about 1000 p.s.i. Pressures found in the greywacke vary from 2100 p.s.i. at 6718 ft to 2750 p.s.i. at 8120 ft. W. S. R.

585. Northwestern Florida—a new oil province? E. G. Jeffreys. *World Oil*, Aug. 1953, **137** (2), 99.—Exploration work is being intensified in the panhandle of Florida as far east as the axis of the Decatur Arch. The Pollard field, discovered in 1952 on the Alabama–Florida border, indicated that the trend of Eutaw–Tuscaloosa production can and probably does extend throughout northwestern Florida.

Several wildcat wells have been drilled, one of them finding dead oil in mud returns, but side-wall coring failed to reveal the source of the oil. 3 of the wells drilled in Santa Rosa county appeared to indicate the existence of complex faulting; this is probably part of the generally *en echelon* strike fault trend coming from Mississippi, complicated by earlier Appalachian faulting.

Difficulties have been encountered in gravimetric and seismic work, as well as core drilling and surface geology. Further difficulties also arose whilst drilling. The causes and remedies of these difficulties are discussed. W. S. R.

586. Woodlawn gas field. J. L. Wiggins. *Petrol. Engr*, Aug. 1953, **25** (8), B90.—The discovery well, drilled in 1947, had an initial reservoir pressure of 2080 p.s.i. and a potential of 7,000,000 cu. ft. in 24 hr.

The field is primarily a gas field, but wells on the edge have a tendency to go to oil. Production is mainly from the Pettit formation at depths around 6400–6500 ft.

Average production of the field over the past year is about 55,000 cu. ft/day. Flowing well pressure is 2200 p.s.i., whilst the flow temp is approximately 120° F. W. S. R.

587. New oil horizon extends Penwell Pool. J. V. Townsend, Jr. *Petrol. Engr*, Aug. 1953, **25** (8), B12.—Drilled originally as an Ellenburger test on the western flank of the Penwell–Jordan pool, this well was completed as a flowing well in June 1953.

Production comes from a porous chert section (Pennsylvanian), perforated from 7828 to 7858 ft. Initial production was 242 b.d. 40·3° API. G.O.R. was 558 cu. ft/brl.

The oil accumulation is evidently due to a stratigraphic trap, and further drilling will be necessary to evaluate and define this new discovery. W. S. R.

588. Cuban exploration travels south. A. Ruschil de la Roche. *World Oil*, June 1953, **136** (7), 243.—All provinces of Cuba have oil and gas seepages, the most important of these being along the north coast.

Among the most promising areas for future exploration is the south and central portion of Habana province. Structural conditions are favourable—a series of parallel anticlines trending from east to west. The centre part of the 87-mile long Madruga Anticlinorium, as the Bejucal dome, offers excellent possibilities, where it is expected that the Tobas (Upper Cretaceous) overlying the Aptychus (Lower Cretaceous) will be of less thickness—as they are in the region of San Antonio de los Banos.

The area is most probably underlain by Jurassic and Lower Cretaceous, considered to be the source rocks for oil in Cuba. W. S. R.

589. Oil in the Olive Orchard. Anon. *World Oil*, July 1953, **137** (1), 247.—Drilling has started in Tunisia despite the lack of knowledge of the sub-surface geology. However, results obtained from this well will help to evaluate further oil possibilities in Tunisia.

The test well, Sainte Juliette 1, is about 20 miles northwest of Sfax, and is being drilled with heavy equipment capable of going down to 15,000 ft. W. S. R.

590. The big pay-off in the neutral zone. Anon. *World Oil*, Aug. 1953, **137** (2), 229.—Discoveries in the neutral zone between Kuwait and Saudi Arabia provide another link in the chain of proved oilfields of the Middle East.

Discovery well—Wafra 4—produced from the initial Burgan sand at 3470 ft, 90 ft shallower than the sand in Kuwait. 150 ft of the sand were penetrated before completion. This indicates a thicker and better defined pay sand than in Kuwait. A drill-stem test flowed 2400 b.d. W. S. R.

TRANSPORT AND STORAGE

591. Process piping. T. R. Olive. *Chem. Engng*, 1953, **60** (12), 187–210.—A primer dealing with the types of equipment associated with pipeline installations and their materials of construction. D. M.

592. Zubair–Fao pipeline. Anon. *Fluid Handl.*, 1953, **46**, 309–13; **47**, 335–9.—A description of the Zubair oilfield with details of plant and equipment is recorded in Pt I. In Pt II the laying of the 24-inch pipeline is dealt with and the Fao terminal described. D. M.

593. How to cement-line pipe for corrosion resistance. F. C. Resen. *Oil Gas J.*, 30.11.53, **52** (30), 91.—The use is described of inexpensive cement-lining procedure for protection of piping handling highly corrosive molten sulphur and water in flow and production lines.

Equipment needed includes cleaning and rinsing vat flame cleaner, roller assembly, cranes, and trolley. G. A. C.

594. "Foam" floating roof pays off. Anon. *Petrol. Process.*, 1953, **8** (12), 1884–8.—Tests under a wide variety of operating conditions and in several tank sizes have shown that evaporation loss reduction in crude oil storage of 80–90% is attainable by the use of the recently-developed "Micro-balloon" technique of Standard Oil Co (Ohio). Data are given for 40-brl tanks over a 66-day period, and on a 25,000-brl tank with a 1-inch covering of foam over a 10-month and 50-day test period.

Details of the pumping equipment required for the installation of the "Micro-balloons" is given, and also a summary of the evaporation loss rate reduction is presented in tabular form. J. W. H.

595. Patents. U.S.P. 2,650,478 (26.2.52; 1.9.53). E. H. Brown, assr to Union Stock Yards and Transit Co. Method of storing liquefied combustible gases (A) which comprises introducing CO_2 into a gas-tight vessel to expel the air and introducing A into the vessel at a temp low enough to freeze the CO_2.

U.S.P. 2,650,556 (28.6.48; 1.9.53). J. R. Turner, assr to Shell Development Co. Applicator for agricultural use for distributing mixtures of vapours and liq.

U.S.P. 2,650,606 (10.10.52; 1.9.53). E. C. Amidon. Fluid level controller for use in pressure storage tanks.

U.S.P. 2,650,738 (12.11.52; 1.9.53). R. C. Ulm, assr to Grarer Tank and Manufacturing Co. Seal mechanism for floating roof tank.

U.S.P. 2,651,433 (24.8.51; 8.9.53). F. O. Mjellem, assr to American Pipe and Steel Corpn. Liq storage tank with floating roof.

U.S.P. 2,651,921 (12.3.51; 15.9.53). J. W. Du Rant. Storage and vaporizing apparatus for liquefied pet gas mixtures.

U.S.P. 2,651,938 (31.5.50; 15.9.53). J. J. Heigl, assr to Standard Oil Development Co. Tank gauging apparatus.

U.S.P. 2,651,939 (27.12.48; 15.9.53). E. A. Weaver, assr to Comstock and Westcott Inc. Tank gauging device utilizing pressure difference between 2 fluids.

U.S.P. 2,651,940 (10.8.50; 15.9.53). K. H. Kline, assr to U.S.A. (Atomic Energy Commission). Apparatus for measuring the level of liq in a container.

U.S.P. 2,651,995 (23.10.51; 15.9.53). C. W. Blackburn, assr to Phillips Petroleum Co. Switch for automatic pumping units in a pipeline system.

U.S.P. 2,652,070 (2.12.47; 15.9.53). R. D. Marx. Gasoline tank truck discharge valve.

U.S.P. 2,652,140 (7.6.52; 15.9.53). C. L. Hall, assr to Sun Oil Co. Portable drum tumbler for use in combination with a conveyor.

U.S.P. 2,652,141 (15.9.50; 15.9.53). F. E. Gilmore, assr to Phillips Petroleum Co. Continuous weighing machine for granular solids.

U.S.P. 2,652,725 (3.6.49; 22.9.53). A. H. Lamb, assr to Weston Electrical Instrument Corpn. Bimetallic thermometer mounting for double-walled storage tanks for liq.

U.S.P. 2,652,943 (9.1.47; 22.9.53). S. V. Williams. High pressure vessel having laminated walls.

U.S.P. 2,652,945 (11.2.50; 22.9.53). N. Walker, assr to General Motors Corpn. Tank closure for closing the neck of fluid storage tanks.

U.S.P. 2,653,478 (30.8.49; 29.9.53). R. W. Harper. Gauge for liq containers.

U.S.P. 2,653,479 (18.10.48; 29.9.53). H. D. Yoder, assr to Buffalo-Eclipse Corpn. Liq level gauge.

U.S.P. 2,653,620 (4.1.49; 29.9.53). T. D. Morgan, assr to Phillips Petroleum Co. Device for regulating gas pressure in containers.

U.S.P. 2,653,623 (23.1.50; 29.9.53). R. W. Hippen and C. L. Murphy. Apparatus for controlling liq level in a vessel.

U.S.P. 2,653,725 (22.11.49; 29.9.53). W. J. Dodge, assr to Socony-Vacuum Oil Co. Drum lift for industrial trucks.

U.S.P. 2,654,067 (18.10.50; 29.9.53). W. A. Bruce, assr to Standard Oil Development Co. Apparatus for detecting a batch change at a point in a pipeline through which separate batches of different petroleum liq are passed. J. M. S.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

596. Bay refinery at Denver. Anon. *Petrol. Refin.*, 1953, **32** (10), 124.—Bay Petroleum Corpn recently completed a large expansion programme at its Denver refinery to handle 11,000 b.d. crude oil. The new cat cracker is designed for 3500 b.d. of gas oil fresh feed at 76% conversion producing gasoline of over 91 O.N., lead free. The gas concn plant recovers 86% of the propane and propylene and all the C_4s. R. D. S.

597. Simplified design for viscous oil heat exchangers. A. Devore and J. E. Heinz. *Petrol. Refin.*, 1953, **32** (12), 105–10.—Equations are developed and simple graphical solutions presented for the solution of heat transfer and pressure drop problems in heat exchangers. The solutions are derived for flow inside tubes, unbaffled flow outside a bare tube bundle, and flow outside a longitudinally finned tube bundle, all for viscous flow of hydrocarbon oils, although the method of extension to other viscous fluids is indicated. A typical problem is solved to indicate the method of using the equations. R. D. S.

598. Short cut estimating of processes. J. F. Gilmore. *Petrol. Refin.*, 1953, **32** (10), 97–101.—A rapid estimate of the overall cost of the principal refinery plants can be made from the cost of the principal items by the addition of certain percentages for piping, erection costs, etc. These percentages are tabulated herein, and are based on a study of detailed cost estimates for various types of plant and on the actual costs of successfully completed plants. R. D. S.

599. Dust collector costs. J. M. Dallavalle. *Chem. Engng*, 1953, **60** (11), 177–83.—Comprehensive cost data dealing with the elimination of airborne solids. 3 aspects are covered:

(1) recovery of material having economic value; (2) collection of materials dangerous to health of employees and residents near discharge point; (3) elimination of general atmospheric nuisances. Graphs are included showing comparative efficiency of several types of collector with costs. D. M.

600. New processes whip waste disposal problems. H. F. Reves. *Petrol. Refin.*, 1953, **32** (10), 139–40.—An account of the effluent treatment processes used by Imperial Oil Ltd before discharging into the Great Lakes. The oil is separated in large circular tanks 110 ft in dia; phenol is removed by bacterial treatment, and excess caustic liquors neutralized by counter-current flue gas streams from the cat cracker. R. D. S.

601. Control methods in boiler feed-water treatment—1. E. W. Ellis and H. E. Carlson. *Oil Gas J.*, 23.11.53, **52** (29), 115.—In this series of the Refiner's Notebook a working chart is presented for estimating proper quantities of lime and soda. G. A. C.

602. Patents. U.S.P. 2,650,480 (22.8.47; 1.9.53). F. E. Gilmore, assr to Phillips Petroleum Co. Method of refrigeration which comprises subjecting a stream of liquefied ammonia in stages to a pressure drop to flash a portion at each stage, thereby cooling the ammonia remaining at each stage and absorbing the ammonia vapours with a stream of aq ammonia in stages of increasing concn and pressure and removing the heat of absorption from the aq ammonia prior to each absorption step.

U.S.P. 2,651,320 (31.3.49; 8.9.53). W. T. Hirsch and E. R. Roth, assrs to Atlantic Refining Co. Gate valve.

U.S.P. 2,651,565 (2.5.51; 8.9.53). D. J. Bergman, assr to Universal Oil Products Co. Apparatus for uniform distribution and contacting of subdivided solid particles.

U.S.P. 2,652,316 (27.4.51; 15.9.53). W. A. Williams, assr to Standard Oil Development Co. Liq–liq contacting tower.

U.S.P. 2,652,317 (1.4.49; 15.9.53). K. A. Rees, T. J. Innes, L. M. Williams, and R. W. Williams, assrs to Standard Oil Development Co. Inlet for reaction vessels in which gases are contacted with finely divided solids.

U.S.P. 2,653,058 (18.10.51; 22.9.53). F. W. Bowen, assr to Sun Oil Co. Apparatus for elevating granular solids.

U.S.P. 2,653,797 (8.11.48; 29.9.53). R. W. Jensen, assr to Garrett Corpn. Submerged valve oil cooler.

U.S.P. 2,653,859 (26.10.49; 29.9.53). A. L. Glaeser, assr to Hercules Powder Co. Pyrolysis furnace. J. M. S.

Ger.P. 878,357, 16.4.53. — Seyerle, assr to Fa. J. Eberspächer, Esslingen. Heat exchangers.
BrennstChemie, 1953, **34** (13–14).

Ger.P. 894,998, 17.9.53. — Ström, assr to Aktiebolaget, Rosenblads Patenter, Stockholm. Heat exchanger with spiral canals.
BrennstChemie, 1953, **34** (19–20). R. T.

DISTILLATION

603. Simplify batch distillation calculations. C. Kwang-Chu. *Chem. Engng*, 1954, **61** (1), 165.—A modification of Brown and Souders' absorption factor method, originally applied to continuous dist. The method described here provides a simple approximation for use in preliminary design. D. M.

604. Improved control gives maximum boil-up in distillations. L. Steber. *Chem. Engng*, 1954, **61** (1), 224–6.—A diagram illustrates how pressure and temp can be used to control steam flow, while allowing operation near the loading point, yet preventing overhead product components from flowing to the bottoms if feed composition should change. D. M.

605. Use of wire-mesh sections in asphalt entrainment control in vacuum pipe stills—2. J. W. Russell. *Oil Gas J.*, 23.11.53, **52** (29), 94.—Case histories are given on the inclusion of wire mesh entrainment eliminators in the refineries of Ohio Oil Co, Sinclair Refining Co, and Rock Island Refining Co. 5 diagrams illustrate the article. G. A. C.

606. Patents. U.S.P. 2,650,481 (27.1.48; 1.9.53). G. T. Cooper, assr to M. W. Kellogg Co. Separation of gaseous mixtures by liquefaction and fractionation.

U.S.P. 2,650,482 (29.4.48; 1.9.53). W. E. Lobo, assr to M. W. Kellogg Co. Fractionation of air, containing acetylene as an impurity, by liquefaction and rectification.

U.S.P. 2,650,809 (26.9.49; 1.9.53). L. P. Wansink and C. L. Haynes, assrs to C. F. Braun and Co. Bubble cap and riser assembly for use on an apertured tray plate.

U.S.P. 2,651,606 (29.10.51; 8.9.53). T. J. Deahl, F. H. Stross, and M. D. Taylor, assrs to Shell Development Co. N : N-dimethylaniline (A) is separated from mixtures with N-methylaniline by adding aniline (B) and dist an azeotrope of A and B from the mixture at atm pressure.

U.S.P. 2,651,666 (5.4.48; 8.9.53). C. H. O. Berg and D. H. Imhoff, assrs to Union Oil Co of California. An ethylene-containing gaseous mixture obtained from cracking liq hydrocarbons is dist to obtain a mixture of hydrogen, methane, and ethylene, as an overhead fraction (A) and leave a bottoms containing ethylene, ethane, and higher mol. wt. hydrocarbons, dist the bottoms in a separate zone, to recover ethylene, contacting A with a moving bed of activated charcoal to absorb ethylene, and finally desorbing this ethylene.

U.S.P. 2,652,238 (10.6.50; 15.9.53). H. B. Manley. Bubble tray water decanter.

U.S.P. 2,652,239 (29.3.52; 15.9.53). J. M. Ballenger, assr to Standard Oil Development Co. Fractionation tray.

U.S.P. 2,653,018 (4.1.52; 22.9.53). J. P. Dunn, assr to Gilbert and Barker Manufacturing Co. Fastening device for bubble cap assemblies. J. M. S.

Ger.P. 894,989, 17.9.53. — Müller and Hanson, assrs to Brennstoff Technik G.m.b.H., Essen and Byk-Gulden Lomberg, Chemische Fabrik G.m.b.H., Konstanz. Process and plant for fractional dist.

Ger.P. 894,425, 17.9.53. Schmidt, assr to Fa. Still, Recklinghausen. Process for continuous fractional dist of tars, mineral oils, and similar liq mixtures.

Ger.P. 895,446, 24.9.53. — Stadelmann, — Broich, and Schöllig, assrs to BASF, Ludwigshafen (Rhein). Process for separating diolefins and paraffins, if necessary olefins, by dist.
BrennstChemie, 1953, **34** (19–20). R. T.

ABSORPTION AND ADSORPTION

607. Refining with adsorbents. Pt V. V. A. Kalichevsky and K. A. Kobe. *Petrol. Refin.*, 1953, **32** (10), 141–4.—The final part of this series deals with the use of adsorbents in vapour phase refining, polymerizing, and desulphurizing processes. R. D. S.

608. Natural gas to alcohol. Anon. *Oil Gas J.*, 30.11.53, **52** (30), 60.—An extraction-fractionation plant is described, operated by National Petro-Chemical Corpn for production of liq petroleum gas from 400 million cu. ft/day of Panhandle gas. Other units include a 325-ton/day ethylene plant, an alcohol unit, and an ethyl chloride unit. G. A. C.

609. Patents. U.S.P. 2,651,603 (29.5.51; 8.9.53). H. Z. Martin and W. K. Lewis, assrs to Standard Oil Development Co. Fractionation of hydrocarbons with solid adsorbents using flue gas stripping.

U.S.P. 2,652,129 (9.5.47; 15.9.53). M. Benedict, assr to Hydrocarbon Research Inc. In the separation of mixed gases by absorption the undissolved gas is reversibly expanded and treated with lean absorption liq. The resulting partially saturated absorption liq is used in the main fractionation zone. The mechanical work of expanding the gas is recovered.

U.S.P. 2,652,437 (19.12.49; 15.9.53). S. J. Marwil, assr to Phillips Petroleum Co. Gas oil of enhanced aromaticity is produced by contacting gas oil with a circulating stream of solid adsorbent capable of adsorbing aromatic hydrocarbons, refluxing the adsorbent containing adsorbed aromatic hydrocarbons by means of natural gas, recovering natural gas denuded of condensable hydrocarbons, the condensable hydrocarbons and the gas oil denuded of aromatic hydrocarbons as separate products of the process, and recovering from the solid adsorbent a gas oil of enhanced aromaticity as the main product of the process. J. M. S.

Ger.P. 894,551, 17.9.53. — Lüde, assr to Silica Gel Gesellschaft Dr. von Lüde & Co., Berlin-Charlottenburg. Process for intermittent, intensive drying of large quantities of air, *e.g.* in air passages.

Ger.P. 894,552, 17.9.53. Siemens-Schuckertwerke A.G., Berlin und Erlangen. Process for removing gases or vapours from a gas or gas–vapour mixture.

Ger.P. 894,391, 17.9.53. — Vollmer, assr to Metallges. A.G., Frankfurt (M.). Process for treating gases and vapours with fine-grained adsorbents, *e.g.* activated C, silica gel, etc.
BrennstChemie, 1953, **34** (19–20).

Ger.P. 897,996, 15.10.53. — Müller, — Bailleul, and — Wisfeld, assrs to Metallges. A.G., Frankfurt (M.). Process for treating liq with activated C.

Ger.P. 897,841, 15.10.53. — Schmidt, assr to Fa. Still, Recklinghausen. Operating procedure for absorption column with direct-acting cooling device for conc NH_3-aq saturation using CO_2.

Ger.P. 897,608, 15.10.53. — Krekeler and — Leutner, assrs to BASF. Process for drying hydrocarbons or derivatives which do not react with hydrogen halide.

Ger.P. 897,462, 15.10.53. — Lagodny, assr to Krupp Kohlechemie G.m.b.H., Wanne-Eickel. Process for treating solids with solvents. (Addn to Pat. 883,148.)

Ger.P. 899,035, 29.10.53. — Göthe, Bielefeld. Oil-wetted filter for separating dust from air or gases. (Addn to Pat. 817,302.)
BrennstChemie, 1953, **34** (21–22). R. T.

SOLVENT EXTRACTION AND DEWAXING

610. Patents. U.S.P. 2,650,897 (21.5.49; 1.9.53). R. C. Woerner, assr to Sinclair Refining Co. In the solvent extraction of asphaltic bitumen (A) with butane, a portion of the extract phase is mixed with A, and a portion of the raffinate phase is mixed with the butane before A and the butane are fed to the extraction zone.

U.S.P. 2,651,594 (26.5.49; 8.9.53). L. J. Blatz, assr to Standard Oil Development Co. Kerosine derived from a Middle East crude having a sulphur content of 1·4% or greater is extracted with 25–100% vol of liq SO_2 at $-40°$ to $+25°$ F to obtain a raffinate having a wick char value >10, and the raffinate is contacted with 0·1–4 lb of a solid adsorbent per brl of oil.

U.S.P. 2,652,439 (3.11.49; 15.9.53). F. C. Neuhart and G. A. Gohlke, assrs to Phillips Petroleum Co. Mixtures of close-boiling unsaturated and more saturated aliphatic hydrocarbons are contacted in the liq phase with a solvent higher boiling than the mixture and selective for the more unsaturated hydrocarbons, and the extract phase is fractionally dist in the presence of an inert organic compound boiling intermediate the solvent and the hydrocarbons present to yield an unsaturated hydrocarbon conc and a bottom fraction. The raffinate phase is fractionally dist in the presence of the bottom fraction to yield a conc of the more saturated hydrocarbons.

U.S.P. 2,653,122 (22.12.48; 22.9.53). G. B. Arnold, H. V. Hess, W. E. Skelton, and W. V. Overbaugh, assrs to Texas Co. Fractional separation of hydrocarbon oils by means of complex formation with urea or thiourea in the presence of a propyl alcohol.

U.S.P. 2,653,123 (25.2.49; 22.9.53). H. A. Kirsch, W. E. Skelton, and W. V. Overbaugh, assrs to Texas Co. Wax is separated from mineral oils by complex formation with urea or thiourea. The urea or thiourea is used in saturated soln in an aliphatic alcohol of 2–5 carbon atoms, and is crystallized out of the soln on contacting the oil.

U.S.P. 2,653,147 (22.5.50; 22.9.53). J. I. Ackerman, assr to Phillips Petroleum Co. Naphthenic hydrocarbons (A) are separated from their oxygenated derivatives by contacting with thiourea (B) in the presence of a low-boiling oxygenated hydrocarbon derivative, a nitrogen-containing activator or water, and separating the complex of A and B. J. M. S.

Ger.P. 877,939, 16.4.53. — Gehle and — Kempe, assrs t MIAG Vertriebsges. m.b.H., Braunschweig. Process and plant for continuous extraction of oil from oliferous materials.
BrennstChemie, 1953, **34** (13–14).

Ger.P. 894,597, 17.9.53. — Pfaff, — Uetze, and — Schumann, assrs to Deutsche Gasolin A.G., Berlin. Process for dewaxing mineral oils with selective solvents.
BrennstChemie, 1953, **34** (19–20). R. T.

CRACKING

611. Evaluation of cracking catalysts. C. K. Viland. *Petrol. Process.*, 1953, **8** (12), 1875–9.—Difficulties have been experienced in finding a practicable method of testing experimental cracking cat. This has prevented a gain in profits from cat cracking for gasoline production.

A new unit is described that has overcome the need for constant supervision, for it operates automatically on a 24-hr cycle. The reactor used was 1½ inches dia, and contained a 20-inch deep cat bed. In the reactor a min vapour vel of 0·05 ft/sec was required to fluidize the bed.

The unit is particularly adapted to studying changes in product distribution as the cat ages with use under simulated commercial conditions. It is also well suited to cat poisoning studies. J. W. H.

612. The mechanical design of fluid catalytic hydroforming units. R. A. Harang. *Petrol. Refin.*, 1953, **32** (10), 135–8.—An analysis of the mechanical design features of this process for upgrading low quality naphthas, based on experience with the first commercial unit installed at Destrehan, La., for Pan-Am Southern Corpn. Vaporized naphtha is injected at the bottom of a fluidized powdered cat bed and the reacted vapours removed at the top via a cyclone to remove entrained cat. Spent cat is withdrawn from the bottom of the bed by a riser pipe and passes to a steam stripper and then to a regenerator. Details of the reactor, regenerator, and cat circulating system are given. R. D. S.

613. New design features of Houdriflow. R. M. Shirk and D. B. Arden. *Petrol. Refin.*, 1953, **32** (12), 121–5.—Some of the process and mechanical problems encountered in the development of moving bed units and the mechanical features embodied in the soln in the present Houdriflow designs are discussed. Details are given of the reactor vapour disengager, kiln air disengager, kiln cooling coils, and kiln withdrawal sections. R. D. S.

614. Gas from oil plant. Anon. *Engineer, Lond.*, 1954, **197**, 19.—Prototype commercial unit installed at Sydenham works of S.E. Gas Board early 1953, for production of town gas from heavy petroleum oil and steam. Reaction carried out at 1000° C in presence of magnesite lime cat over a 6-min cycle. Plant uses about 12 tons oil per day to produce 800,000 cu. ft. of C.V. 480–508 B.T.U/cu. ft. and saves 60 tons coal per day. A. C.

615. Patents. U.S.P. 2,650,906 (Netherlands 31.3.49; 1.9.53). W. F. Engel and H. Hoog, assrs to Shell Development Co. Preparation of molybdenum–cobalt, tungsten–cobalt, or tungsten–nickel cat by impregnating a foraminous carrier with an aq alkanolamine soln of water-sol compounds of the metals and calcining the impregnated carrier.

U.S.P. 2,651,598 (17.3.51; 8.9.53). F. G. Ciapetta, assr to Atlantic Refining Co. Gasolines are reformed by passage with hydrogen at 600°–1000° F and a pressure of 100–1000 p.s.i. over a cat consisting of a cracking component, 0·01–2·5 wt % of platinum or palladium, and 0·5–4·0 wt % of alkali metal. The cracking component comprises silica and alumina, magnesia, thoria, or zirconia.

U.S.P. 2,651,599 (8.9.49; 8.9.53). R. N. Watts and J. P. Bilisoly, assrs to Standard Oil Development Co. Silica–alumina, silica–magnesia, and silica–magnesia–alumina cracking cat are reactivated following repeated regenerations, by treating regenerated cat with steam containing 0·01–10 wt % of hydrogen fluoride at $\leq$850° F.

U.S.P. 2,651,600 (21.2.50; 8.9.53). W. O. Taff and R. L. Hardy, assrs to Standard Oil Development Co. Method of reducing contaminants on fluidized cat which comprises adding fresh cat of a particle size above 40 μ, subjecting the cat in the circuit to accelerated attrition to produce particles below 40 μ and expose the central core free of contaminants, and continuously separating and discarding from the circulating cat the fine particles at a rate to maintain 10–20% of fine particles in the circuit.

U.S.P. 2,651,601 (3.1.49; 8.9.53). W. O. Taff and J. Weikart, assrs to Standard Oil Development Co. High quality feed for cat cracking is produced by dist a pet crude oil at atm pressure to separate light constituents and a gas oil fraction boiling from 430° to 900° F and leave a residual stock (A), stripping A at sub-atm pressure to remove further gas oil (B), visbreaking the stripped A and dist the product at atm pressure to separate visbreaker gas and gasoline from visbreaker residue (C), stripping C to separate visbreaker gas oil (D), mixing B and D, recycling part of the stripped C to the visbreaking step, and removing sufficient stripped C from the system to prevent excessive accumulation of ash and carbon residues.

U.S.P. 2,651,617 (16.4.49; 8.9.53). L. Schmerling, assr to Universal Oil Products Co. Alumina-containing composite cat are improved by heating with an organic acid having a dissociation constant $<10^{-3}$, at 150° to 300° C under sufficient pressure to maintain the acid in the liq phase, and then treating with water at a temp above 100° C and under pressure to maintain the water in the liq phase, to hydrolyse the aluminium salt formed.

U.S.P. 2,652,371 (20.12.49; 15.9.53). J. L. Gring, assr to Sinclair Refining Co. Spheroidal cat particles are formed and classified by discharging aq sodium silicate soln as a stream of droplets at an oblique angle, segregating the droplets into at least 2 fractions according to the difference of their trajectories, collecting one of the fractions while still liq, recycling the fraction to the body of sodium silicate soln, and solidifying another fraction of droplets by contacting with a fluid acidic medium.

U.S.P. 2,653,138 (7.12.50; 22.9.53). W. R. Middleton, assr to Socony-Vacuum Oil Co. Cat consisting of 1–40 mol % of an oxide of a Group VI metal having an at. wt. of at least 96 and a tellurium oxide.

U.S.P. 2,653,176 (10.6.50; 22.9.53). La V. H. Beckberger, assr to Sinclair Refining Co. Hydrocarbon fractions rich in alkylated fused-ring aromatic compounds are converted to lower mol. wt. compounds by contacting with a hydrogen-rich gas, steam, and a cat comprising iron oxide, chromia, and an inorganic oxygen-containing sodium or potassium compound, at a liq space velocity of 0·1–5 vol per vol of cat/hr at 1200°–1800° F.

U.S.P. 2,653,903 (9.6.50; 29.9.53). M. O. Kilpatrick, assr to Phillips Petroleum Co. Combination process for cracking normally gaseous hydrocarbons and normally liq hydrocarbons using a solids heating zone and 2 cracking zones.
J. M. S.

Ger.P. 895,760, 24.9.53. — Klar, Frankfurt (M.). Procedure for improving heat removal in exothermic cat reactions with pulverulent cat.

Ger.P. 895,442, 24.9.53. — Dorschner, assr to Metallges. A.G., Frankfurt (M.). Contact furnace.

Ger.P. 895,448, 24.9.53. — Klette, assr to Forschemie Ges. für pharmazeutische und chemisch-technische Produkte m.b.H., München-Pasing. Process for splitting H_2O from alcohols.

BrennstChemie, 1953, **34** (19–20). R. T.

HYDROGENATION

616. Patents. U.S.P. 2,650,941 (Netherlands 6.4.50; 1.9.53). J. Koome and C. N. J. de Nooijer, assrs to Shell Development Co. Monosaccharides are converted to hexitol by passing an aq soln of the monosaccharide and hydrogen through a bed of cat consisting of nickel silicate and reduced nickel on a solid carrier, at 100°–180° C and 25–200 atm.

U.S.P. 2,651,655 (29.6.49; 8.9.53). R. T. Loughran, assr to M. W. Kellogg Co. Liq waxy products produced by the Fischer–Tropsch process are refined by dissolving in a solvent, contacting with a solid adsorbent, removing from the adsorbent, and hydrogenating in the presence of a hydrogenation cat at 150°–400° F and at a pressure between 75 and 1500 p.s.i.g. for a residence time of at least 30 min. J. M. S.

Ger.P. 878,050, 16.4.53. — Pier and — Krönig, assrs to BASF, Ludwigshafen (Rhein). Process for cat pressure hydrogenation of high-boiling liq or fusible hydrocarbon oils.

BrennstChemie, 1953, **34** (13–14).

Ger.P. 894,990, 17.9.53. — Goetze, assr to BASF, Ludwigshafen (Rhein). Process for continuous pressure hydrogenation of coals, tars, and mineral oils in liq phase. (Addn to Pat. 849,444.)

BrennstChemie, 1953, **34** (19–20).

Ger.P. 897,550, 15.10.53. — Pier, — Donath, and — Free, assrs to BASF. Process for cracking pressure hydrogenation of heavy and middle oils. (Addn to Pat. 767,222.)

Ger.P. 897,999, 15.10.53. — Royen and — Herbert, assrs to Metallges. A.G., Frankfurt (M.). Process for hydrogenating carbon compounds.

Ger.P. 897,558, 15.10.53. — Friederich and — Koudela, assrs to BASF. Process for cat hydrogenation of C_2H_2 compounds.

Ger.P. 898,439, 22.10.53. — Bähr, assr to BASF. Method for processing residues of pressure hydrogenation of coals, tars, mineral oils, or of pressure extraction products from coals. (Addn to Pat. 867,088.)

BrennstChemie, 1953, **34** (21–22). R. T.

POLYMERIZATION

617. Patents. U.S.P. 2,650,913 (23.3.50; 1.9.53). T. Boyd, assr to Monsanto Chemical Co. Ethylene is polymerized at 260°–300° C and 2500–3000 atm in the presence of 2 : 2-*bis* (*tert*-butyl peroxy)-butane.

U.S.P. 2,651,626 (Netherlands 23.3.44; 8.9.53). W. L. J. de Nie, assr to Shell Development Co. A mixture of vinyl chloride, vinylidene chloride, and methyl methacrylate is polymerized in aq emulsion in the presence of a peroxide cat at 15°–100° C.

U.S.P. 2,652,372 (10.7.51; 15.9.53). M. W. Farlow and E. C. Herrick, assrs to E. I. du Pont de Nemours and Co. Hydrocarbon polymers obtained by reaction of CO and H_2. The polymers are orientable by cold-drawing, melt above 130° C, and are capable of forming tough films having a density of at least 0·97.

U.S.P. 2,652,392 (G.B. 17.5.50; 15.9.53). W. P. Hohenstein, R. N. Haward, and J. Elby. In the aq suspension polymerization of a compound containing a vinyl group in the presence of a polymerization cat and calcium phosphate as a suspension stabilizer, up to 0·01 wt % of a water-soluble persulphate is added to the aq suspension.

U.S.P. 2,652,393 (21.5.49; 15.9.53). J. B. Dickey and H. W. Coover, assrs to Eastman Kodak Co. Resinous polymers of compounds of the formula $CH_2 = CX_1X_2$, wherein X_2 represents $-CHF_2$, $-CF_3$, or H, and X_1 represents $-CN$, $-CONR_3R_4$, or $-COOR_1$, R_1 being an alkyl group of 1–4 carbon atoms and R_3 and R_4 being H or an alkyl group of 1–4 carbon atoms, are made by contacting the monomer at $-80°$ to 200° C with 0·01–25 wt % of a trialkyl, dialkyl hydrogen, or dialkyl metal phosphite in which each alkyl group contains 1–4 carbon atoms.

U.S.P. 2,653,145 (15.3.51; 22.9.53). W. P. Hohenstein, assr to Whitney Blake Co. Rubber-like copolymers are made by mixing a vinylidene compound, a conjugated diolefin, a polymerization cat, and a dispersing fluid which is a non-solvent for the monomers, agitating at 120°–325° F until the desired copolymer is formed, chilling to below 50° F, and freeing the copolymer particles from the dispersing fluid. J. M. S.

Ger.P. 878,347, 16.4.53. — Christmann, assr to BASF, Ludwigshafen (Rhein). Method for producing condensation products.

Ger.P. 878,201, 16.4.53. — Beucker, assr to Chemische Werke Albert, Wiesbaden-Biebrich. Method for producing higher-mol condensation products from *sec*-alcohols.

Ger.P. 877,898, 16.4.53. — Orthner, — Platz, and — Horst, assrs to Farbwerke Hoechst, formerly Meister Lucius & Bruning. Method for producing ester-like condensation products.
BrennstChemie, 1953, **34** (13–14).

Ger.P. 897,099, 8.10.53. — Waibel and — Zorn, assrs to Knapsack-Griesheim A.G., Knapsack bei Koln. Method for producing higher-mol unsaturated aldehydes.

Ger.P. 897,699, 15.10.53. — Dorschner, assr to Metallges. A.G., Frankfurt (M.). Method for cat production of higher hydrocarbons and hydrocarbon compounds.

Ger.P. 897,700, 15.10.53. — Herbert, — Danulat, and — Hubmann, assrs to Metallges. A.G., Frankfurt (M.). Method for producing higher paraffin and olefin hydrocarbons. (Addn to Pat. 761,883.)

Ger.P. 897,702, 15.10.53. Universal Oil Products Co., Des Plaines, Ill. Process for polymerizing low-boiling, *e.g.* normally gaseous olefins.

Ger.P. 898,736, 22.10.53. — Rummel, assr to Siemens & Halske A.G., Berlin und München. Procedure for limiting the polymerization degree in producing unsaturated org compounds.
BrennstChemie, 1953, **34** (21–22). R. T.

ALKYLATION

818. Patents. U.S.P. 2,652,405 (5.6.48; 15.9.53). R. E. Conary and R. F. McCleary, assrs to Texas Co. Thianaphthenes are reacted with an alkylating agent containing at least 3 carbon atoms in the presence of sulphuric acid of a concn ≥ 88 wt %.

U.S.P. 2,652,434 (13.6.51; 15.9.53). W. W. Johnstone, assr to Universal Oil Products Co. Aromatic hydrocarbons are alkylated with olefins in the presence of $B_4O_7(H_3P_2O_4)_2$.

U.S.P. 2,653,980 (30.8.46; 29.9.53). F. E. Condon, assr to Phillips Petroleum Co. A mixture of an aromatic hydrocarbon, an *iso*paraffin, and an olefin is reacted in the presence of anhydrous hydrofluoric acid at 20°–30° C in the liq phase.

U.S.P. 2,653,982 (30.3.51; 29.9.53). R. M. Kennedy and C. K. Donnell, assrs to Sun Oil Co. Branched chain paraffins are made by reacting, at $-120°$ to 150° C, an *iso*paraffin and an olefin in the presence of a mixture of BF_3 and an alkyl fluoride having at least 2 carbon atoms. J. M. S.

Ger.P. 897,998, 15.10.53. — Kolling and — Rappen, assrs to Ruhrchemie A.G., Oberhausen-Holten. Process for alkylation of aromatic hydrocarbons.
BrennstChemie, 1953, **34** (21–22). R. T.

ISOMERIZATION

619. Patents. U.S.P. 2,651,597 (18.1.50; 8.9.53). E. S. Corner and F. B. Fischl, assrs to Standard Oil Development Co. The anti-knock value of light virgin naphtha is improved by fractionating it into a hexane fraction (A), boiling up to 158° F, an alkyl*cyclo*pentane fraction (B), boiling 158°–200° F, an *n*-heptane fraction (C), boiling 200°–211° F, and a heavy naphtha fraction (D) boiling above 211° F, isomerizing A, isomerizing B, mixing the isomerized B with D, and hydroforming the mixture, aromatizing C, and mixing the isomerized A with the aromatized and hydroformed fractions.

U.S.P. 2,653,981 (24.1.51; 29.9.53). J. P. Hogan, assr to Phillips Petroleum Co. Process for shifting a methyl group in a branched-chain olefin having 8–16 carbon atoms which comprises contacting the olefin with a cat comprising silica gel promoted with 0·1–10·0 wt % alumina and 0·1–10·0 wt % nickel or cobalt oxide at 75°–175° F, a pressure of 1–50 atm, and a space velocity of 0·2–20·0 vol/vol cat/hr. J. M. S.

Ger.P. 894,596, 17.9.53. — Rottig, assr to Ruhrchemie A.G., Oberhausen-Holten. Method for producing mixed cat for aromatization of hydrocarbons.
BrennstChemie, 1953, **34** (19–20). R. T.

CHEMICAL AND PHYSICAL REFINING

620. Symposium on desulphurization today. Anon. *Petrol. Refin.*, 1953, **32** (12), 81–92.—An outline of the uses and aims of desulphurization of petroleum fractions, followed by descriptions and flowsheets of 9 major desulphurizing processes, including both cat and extractive types. R. D. S.

621. Operating the liquid-dessiccant dehydration plant. J. A. Gordon. *Oil Gas J.*, 7.12.53, **52** (31), 108.—Problems met in plant operation are discussed. An important factor is correct control of dew-point and water content of the treated gas stream, which results in fuel savings, less corrosion and glycol contamination, and small glycol losses. Foaming is prevented by use of very small concn of anti-foaming agents. Figures and a flow sheet illustrate the article. G. A. C.

622. Patents. U.S.P. 2,650,670 (26.1.50; 1.9.53). M. T. Cichelli, assr to Gulf Research and Development Co. Method of concentrating a component of a vapour mixture (A) which comprises introducing into a separating zone A and a secondary vapour (B) which has a dew point such that it will not be condensed on mixing with A, forming separate portions of A, richer respectively in a more diffusible and a less diffusible component, condensing the portion richer in the more diffusible component in the separating zone, and removing the other portion as a vapour. B is sufficiently insoluble in the condensed portion that its rate of removal in vapour form exceeds its rate of removal in the condensate.

U.S.P. 2,650,675 (9.3.50; 1.9.53). J. I. Yellot, assr to Bituminous Coal Research Inc. Method of separating particulate solids and fluid droplets from a gas, comprising establishing a primary spinning core of the gas within a secondary, co-flowing and co-spinning sheath of colder gas. The solids and droplets transfer to the secondary stream, and the two streams are separated.

U.S.P. 2,650,898 (27.10.51; 1.9.53). E. N. Case, assr to Sinclair Refining Co. Asphaltenes and metal contaminants are removed from crude oil prior to desalting and refining, by saturating the crude at 15–200 p.s.i.g. with gaseous hydrogen chloride.

U.S.P. 2,651,595 (20.5.50; 8.9.53). B. L. Moulthrop, assr to Socony-Vacuum Oil Co. Pet fractions are sweetened by adding any oxygenated chelate of iron, cobalt, nickel, or palladium and contacting with an aq solution of an alkali metal hydroxide.

U.S.P. 2,651,596 (4.4.52; 8.9.53). J. H. Krause, assr to Standard Oil Co. Mercaptan-containing virgin hydrocarbon distillates are contacted with sulphuric acid in the presence of sulphuryl chloride.

U.S.P. 2,651,602 (4.11.48; 8.9.53). H. R. Davis and C. F. Montross, assrs to Lummus Co. Process and apparatus for the continuous clay refining of luboils.

U.S.P. 2,651,654 (21.1.49; 8.9.53). B. N. Hill, assr to Standard Oil Development Co. Naphtha fractions from the Fischer–Tropsch synthesis are washed with an aq solution of an alkali metal hydroxide, contacted with an alcoholic solution of hydroxylamine or an inorganic salt thereof, again washed with an aq solution of an alkali metal hydroxide and finally dist.

U.S.P. 2,651,665 (10.6.50; 8.9.53). J. D. Booker, assr to Standard Oil Development Co. Recovery of pure *p*-xylene (A) from mixtures with its isomers by cooling the mixture to a temp no lower than its eutectic point to form a slurry of A crystals in a mother liquor, centrifuging for no more than 2 min to separate a first cake (B) and a first mother liquor, heating B to −30° to 40° F, to form a slurry containing 30–85% wt of A crystals, centrifuging this slurry for a time sufficient to separate a second cake having an A content >90% from a second mother liquor (C), and mixing at least a portion of C with original mixture to be treated.

U.S.P. 2,651,922 (2.9.49; 15.9.53). B. L. Graham, assr to Phillips Petroleum Co. Method of separating a mixture into a higher-melting and lower-melting fraction which comprises freezing a portion of the mixture, removing the solid from the liq, mechanically expressing the occluded mother liquor from the solid, returning the expressed liq as reflux over the removed solid to the mother liquor, re-melting the solid to form a new mother liquor, and repeating the operation.

U.S.P. 2,652,415 (29.9.48; 15.9.53). V. F. Michael, assr to Stanolind Oil and Gas Co. In the separation of alcohols, aldehydes, and ketones (A) from hydrocarbons by contacting the mixture with an aqueous solution of a salt of a carboxylic acid, the aqueous extract is heated to above 60° C to stratify an organic phase which is removed, and the aqueous phase is dist to recover A.

U.S.P. 2,652,435 (14.11.49; 15.9.53). H. V. Hess and G. B. Arnold, assrs to Texas Co. Polycyclic aromatic compounds (A) are separated from organic mixtures by forming complexes of A with tetrahydrophthalic anhydride, separating the complexes in solid form at a temp below 150° F and decomposing the complexes by contact with steam at 300°–500° F.

U.S.P. 2,652,436 (7.12.49; 15.9.53). H. V. Hess and G. B. Arnold, assrs to Texas Co. Polycyclic aromatic compounds (A) are separated from organic mixtures by forming complexes of A with a tetrahalophthalic anhydride, separating the complexes in solid form at a temp below 150° F, and decomposing the complexes by dilute caustic solution.

U.S.P. 2,652,438 (23.2.50; 15.9.53). G. B. Arnold and H. V. Hess, assrs to Texas Co. Acenaphthene and its homologues (A) are recovered from mixtures containing them by forming complexes of A with a dihalophthalic anhydride, separating the complexes in solid form at a temp below 150° F and decomposing the complexes by contact with steam at 300°–600° F.

U.S.P. 2,652,591 (31.1.51; 22.9.53). H. C. Kuhn, assr to Sinclair Refining Co. Apparatus for the treatment of pitch.

U.S.P. 2,652,593 (31.1.51; 22.9.53). K. A. Smith and D. K. Hedeen, assrs to Sinclair Refining Co. Molten pet pitch is cooled and solidified by injecting the liq pitch into a body of water and injecting a fluid into the pitch as it enters the water.

U.S.P. 2,652,594 (31.1.51; 22.9.53). O. F. Campbell, assr to Sinclair Refining Co. Molten pitch is cooled and solidified by injecting it into a stream of water having such a velocity as to maintain a turbulent zone at the point of pitch entry.

U.S.P. 2,653,124 (24.11.50; 22.9.53). J. H. Krause, assr to Standard Oil Co. Hydrocarbon distillates are sweetened by contacting with dry cupric chloride on an adsorbent support in the presence of oxygen, contacting with water at above 100° F, and adding to the washed oil 0·0002–0·01 wt % of a copper deactivator.

U.S.P. 2,653,125 (27.12.50; 22.9.53). J. H. Krause, assr to Standard Oil Co. Mercaptan-containing hydrocarbon oils are sweetened by contacting in the liq phase with a cat comprising an inert adsorbent material, copper sulphate or a copper sulphonate, and at least 8 wt % of water, at 90°–230° F in the presence of oxygen.

U.S.P. 2,653,135 (4.1.51; 22.9.53). W. B. Hughes and E. B. Fisher, assrs to Cities Services Research and Development Co. Pet water-in-oil emulsions are broken by means of a product made by mixing 1–3 mols of an aliphatic aldehyde (other than formaldehyde) with 1 mol of a mixture of a polyethylene amine and an alkylamine having more than 4 carbon atoms, heating for ½–1 hr at a temp just below the b.p. of the mixture, and neutralizing to a methyl orange end point with propylated naphthalene sulphonic acid.

U.S.P. 2,653,136 (14.6.50; 22.9.53). W. B. Hughes, assr to Cities Services Oil Co. Pet water-in-oil emulsions are broken by means of a product made by reacting 1 mol of an aldehyde or ketone with 2 mols of a polyethylene amine and neutralizing to a methyl orange end point with propylated naphthalene sulphonic acid.

U.S.P. 2,653,137 (4.1.51; 22.9.53). W. B. Hughes and E. B. Fisher, assrs to Cities Services Research and Development Company. Pet water-in-oil emulsions are broken by means of a product made by reacting 1 mol of benzaldehyde with 1 mol of an alkylamine, driving off the water formed, further reacting with 1 mol of a polyethylene amine, and neutralizing to a methyl orange end point with propylated naphthalene sulphonic acid. J. M. S.

Ger.P. 894,390, 17.9.53. — Haltmeier, assr to Farbenfabriken Bayer A.G., Leverkusen-Bayerwerk. Purification of gases laden with suspended particles.

Ger.P. 894,553, 17.9.53. — Ohme, assr to Dortmunder Paraffinwerke G.m.b.H., Dortmund. Process for separating fatty acids from reaction gases and vapours of CO hydrogenation containing CO_2.

BrennstChemie, 1953, **34** (19–20). R. T.

SPECIAL PROCESSES

623. New fluid coking process unveiled. A. Voorhies and H. Z. Martin. *Petrol. Refin.*, 1953, **32** (12), 127–30; *Petrol. Process.*, 1953, **8** (12), 1880–1.—The Standard Oil Development Co's fluid coking process for upgrading residua utilizes some of the finely divided coke formed to provide heat for the reaction and some to act as a fluidized cat. The process is continuous, and the temp of 500°–700° F at which residua are normally available are adequate to obtain good feed dispersion. A description of the process and some details of the yields obtained from a 100-b.d. pilot plant are given. R. D. S.

624. The Lummus continuous contact coking process. V. Mekler, A. H. Schutte, and T. T. Whipple. *Petrol. Refin.*, 1953, **32** (12), 131–4; *Petrol. Process.*, 1953, **8** (12), 1882–3.—A report on the performance of the first commercial unit erected in the McKee refinery of Shamrock Oil and Gas Corpn, Sunray, Texas. It was designed to process 1000 b.d. vacuum-dist residue for the production of gas, gasoline, gas oil, and coke. The unit has been in operation for 8 months, during which period yields over a wide range of operating conditions were obtained. Data on yields, product specifications, and operating costs are presented. R. D. S.

625. Patents. U.S.P. 2,648,711 (19.7.49; 11.8.53). E. W. Carrier, assr to Standard Oil Development Co. A process for the production of an ether-free saturated monohydric alcohol by the direct hydration of an olefin which comprises reacting the olefin with water vapour in a reaction zone, removing from the reaction zone a gaseous product comprising alcohol, ether, and unreacted olefins, and passing the gaseous product without reduction in temp and pressure to an intermediate point of an extractive dist zone which is supplied with water.

U.S.P. 2,648,712 (22.3.51; 11.8.53). A. Schneider, assr to Sun Oil Co. Process of separating a 1 : 4-dialkyl benzene from an admixture thereof with at least one isomer by selective alkylation.

U.S.P. 2,648,713 (22.3.51; 11.8.53). A. Schneider, assr to Sun Oil Co. Process of separating a 1 : 2-dialkyl benzene from an admixture thereof with a 1 : 3-dialkyl benzene which is an isomer of the 1 : 2-dialkyl benzene by selective alkylation.

U.S.P. 2,649,358 (7.1.47; 18.8.53). G. H. Palmer, assr to M. W. Kellogg Co. A method for separating a gas from finely divided solids suspended therein which comprises passing a stream of gas containing suspended solids to a porous membrane which is arranged substantially vertically and which is substantially impervious to the solids.

U.S.P. 2,649,404 (26.9.50; 18.8.53). T. G. Reynolds, assr to United Engineers and Constructors Inc. A process for the recovery of naphthalene from hot coke oven gases comprising contacting the gases with a substantially naphthalene-free absorber oil. D. A. R.

U.S.P. 2,650,660 (15.6.50; 1.9.53). T. E. Martin and E. Edmunds, assrs to Phillips Petroleum Co. The concn of aq ammonium nitrate solution is adjusted by passing a dilute solution of ammonium nitrate at superatmospheric pressure into a vacuum evaporator at a temp above the b.p. of a more conc solution maintained in the evaporator at a pressure of 6 inches Hg absolute, introducing cooling water into the evaporator in a ratio of 5–20 vols water per 100 vols ammonium nitrate solution, and maintaining the solution in the evaporator at a predetermined b.p. by controlling the amount of water introduced.

U.S.P. 2,650,927 (G.B. 26.3.49; 1.9.53). E. J. Gasson, A. F. Millidge, and W. Webster, assrs to Distillers Co. α-Di-*iso*butene is reacted in the liq phase at 90°–150° C with oxygen in the presence of a cobalt, lead, manganese, iron, vanadium, nickel, tungsten, copper, cerium, zinc, cadmium, chromium, or silver compound to produce 1 : 2-epoxy-2 : 4 : 4-trimethylpentane. The reaction mixture is maintained at a pH between 7 and 10·5.

U.S.P. 2,650,940 (G.B. 11.3.50; 1.9.53). D. P. Young, assr to Distillers Co. 1-Phenylethane-1 : 2-diol is made by heating 1 : 2-epoxy-1-phenylethane in a closed vessel at 90°–200° C in the presence of an aqueous alkaline solution.

U.S.P. 2,650,942 (20.3.51; 1.9.53). A. H. Maude and D. S. Rosenberg, assrs to Hooker Electrochemical Co. Hexachloro*cyclo*pentadiene is made by passing a vapour phase mixture of a C_5 chlorohydrocarbon containing more than two chlorine atoms per mol and chlorine into contact with a porous surface active inorganic solid at 300°–430° C and then into an empty reaction zone at 450°–525° C.

U.S.P. 2,651,652 (16.9.47; 8.9.53). E. E. Sensel, assr to Texas Co. In the Fischer–Tropsch process using a gravitating shower of dispersed, solid particle cat and concurrent flow of the synthesis gas, sticky deposits on the cat are stripped by means of a countercurrent hydrogen stream.

U.S.P. 2,651,653 (18.12.48; 8.9.53). C. E. Hemminger, assr to Standard Oil Development Co. The Fischer–Tropsch process is carried out with fluidized cobalt cat in two stages. In the first stage only 40–50% of the carbon monoxide is converted. The gases from the first stage are subjected to a water gas shift reaction, carbon dioxide is removed and the remaining gas used in the second stage.

U.S.P. 2,652,313 (3.4.51; 15.9.53). W. L. Loving, assr to Godfrey L. Cabot Inc. Furnace carbon black is made by admitting alternate thin vertical layers of air and gas into a combustion space under conditions of incomplete combustion, thereby causing burning to take place at the interface of the layers with decomposition of the unconsumed gas, and injecting a fine spray of hydrocarbon oil into the centre of the combustion space. The spray of oil is formed by atomizing into a divergent conical body with gas.

U.S.P. 2,652,319 (3.1.49; 15.9.53). S. B. Sweetser and W. G. Scharmann, assrs to Standard Oil Development Co. Water-gas is generated by treating fluidized solid carbonaceous material with steam at 1500°–2000° F, passing at least a portion of the resulting finely divided char to a cat impregnating zone, where it is impregnated with a cat, promoting gasification of carbon and recycling the impregnated char to the water-gas generation zone.

U.S.P. 2,652,344 (1.4.49; 15.9.53). R. K. Simms, assr to Phillips Petroleum Co. Carbon black pellets are produced by reacting H_2S and SO_2 in the presence of bauxite at 400°–600° F to form vaporous sulphur, which is added to a stream of carbon black in gaseous suspension. The resulting mixture of carbon black and sulphur is dry pelleted at temp >175° F and below the m.p. of sulphur.

U.S.P. 2,652,404 (1.7.48; 15.9.53). H. D. Hartough, assr to Socony-Vacuum Oil Co. 2-Thenylformaldimines are made by adding alkali hydroxide to a solution of a 2-thenylaminomethylsulphonic acid.

U.S.P. 2,652,410 (12.10.48; 15.9.53). O. D. Cunningham and O. L. Polly, assrs to Union Oil Co of California. Gelled products are made by heating an α-hydroxy carboxylic acid having 5–30 carbon atoms or an estolide or dehydroxylated estolide having 10–60 carbon atoms, in the presence of a polyhydric alcohol, polyamine, or amino-alcohol having <10 carbon atoms at 100°–200° C for a time sufficient to liberate water but insufficient to cause gelation, cooling and curing at 75°–125° C to effect gelation.

U.S.P. 2,652,413 (7.11.50; 15.9.53). R. W. Rosenthal, assr to Texas Co. α-Methylalkanoic acids are made by reacting olefins with carbon monoxide and water in the presence of a cat comprising 50–95% nickel carbonyl, 1–25% nickel halide, and 4–25% hydrochloric acid, at 500°–700° F and at a pressure of 1000–5000 p.s.i.g.

U.S.P. 2,652,426 (4.2.48; 15.9.53). R. D. Stayner, assr to California Research Corpn. Alkanephosphonic acids are made by heating to its b.p. a mixture of 1 mole of an alkanephosphonyl dichloride (A) having 10–18 carbon atoms in the alkyl group attached to the phosphorus atom and at least 2 moles of a saturated aliphatic monocarboxylic acid, the acid chloride of which boils below the b.p. of A.

U.S.P. 2,652,427 (26.8.50; 15.9.53). A. Shultz, assr to Allied Chemical and Dye Corpn. Alkylaromatic sulphonic acids (A) are made by reacting an alkylaromatic hydrocarbon having 10–20 carbon atoms in the alkyl group with a sulphonating agent, mixing the reaction mixture with a water-sol polyhydric alcohol to cause A to separate as a distinct layer, and separating off this layer.

U.S.P. 2,652,429 (17.6.50; 15.9.53). H. D. Hartough, J. J. Dickert, and S. L. Meisel, assrs to Socony-Vacuum Oil Co. Basic nitrogeneous derivatives are made by reacting a pet hydrocarbon fraction containing olefins, with formaldehyde and an ammonium halide at 50°–150° C.

U.S.P. 2,652,430 (13.2.50; 15.9.53). H. de V. Finch and S. A. Ballard, assrs to Shell Development Co. N-Substituted 1 : 3-alkanediamines of the formula $R_2N{\cdot}CR'_2{\cdot}CHR'{\cdot}CH_2{\cdot}NR'_2$ are made by heating a compound of the formula $R_2N{\cdot}CR'_2{\cdot}CR':CH{\cdot}NRR''$ with a mole excess of an amine of the formula HNR_2' in the presence of hydrogen and a hydrogenation cat at 50°–300° C under a hydrogen pressure of 500–10,000 p.s.i. In the formulæ R is hydrogen or a non-aromatic hydrocarbon radical, R′ is hydrogen or a lower alkyl radical, and R″ is a non-aromatic hydrocarbon radical.

U.S.P. 2,653,077 (9.5.49; 22.9.53). R. S. Ogilvie, assr to Phillips Petroleum Co. Production and recovery of ammonium sulphate.

U.S.P. 2,653,089 (7.11.49; 22.9.53). J. M. Brooke, assr to Phillips Petroleum Co. Heavy metals are removed from aq saline soln by contacting the soln with an ion exchange material containing replaceable iron ions.

U.S.P. 2,653,155 (21.4.51; 22.9.53). A. R. Kittleson, assr to Standard Oil Development Co. N-Trichloromethylthioimides are made by reacting an aq soln of an alkali metal imide of a di-carboxylic acid with perchloromethyl mercaptan at 10°–30° C and at a pH of 10–10·5 and then mixing the reaction mixture until it has a pH of 7–8·5.

U.S.P. 2,653,159 (24.12.49; 22.9.53). G. W. Beste, H. M. Tanner, and H. Shapiro, assrs to Ethyl Corpn. T.E.L. is made by reacting a sodium–lead alloy containing from 80 to 86·5 wt % of lead with ethyl chloride in the presence of a lead ethylation cat at 80°–140° C.

U.S.P. 2,653,165 (27.1.50; 22.9.53). I. E. Levine, assr to California Research Corpn. Monoesters of phthalic acid are made by oxidizing toluic acid esters of low mol. wt. alkanols by contacting with an oxygen-containing gas at an elevated temp.

U.S.P. 2,653,175 (4.5.51; 22.9.53). W. H. Davis, assr to Sun Oil Co. Aromatic hydrocarbons are prepared by distilling a pet stock to obtain a fraction (A) containing C_6 and C_7 naphthenes and a fraction (B) containing C_8 naphthenes, dehydrogenating A to form benzene and toluene, dehydrogenating B to form xylenes, distilling the second dehydrogenation product to separate a xylene-rich fraction (C), contacting the first dehydrogenation product with a selective adsorbent to adsorb benzene and toluene and displace xylene from the adsorbent, contacting the adsorbent with C to adsorb xylene and displace benzene and toluene, recovering from the adsorbent two portions, one of which consists of non-aromatic hydrocarbons and xylene and the other of benzene, toluene, and xylene, and distilling each portion to obtain a xylene-rich product.

U.S.P. 2,653,391 (1.2.51; 29.9.53). E. Edmunds, assr to Phillips Petroleum Co. Drying of granule ammonium nitrate.

U.S.P. 2,653,952 (25.5.50; 29.9.53). R. B. Egbert, assr to Chempatents Inc. Ethylene, helium, and oxygen are passed over a silver cat at 220°–350° C to produce ethylene oxide.

U.S.P. 2,653,959 (22.3.49; 29.9.53). F. J. Moore and H. V. Hess, assrs to Texas Co. Separating oxygenated organic compounds from the oil phase of the products of the Fischer–Tropsch process, using a solid adsorbent and hydrogenating during the desorption step.

U.S.P. 2,653,960 (26.3.49; 29.9.53). H. V. Hess, G. B. Arnold, and M. L. Drabkin, assrs to Texas Co. The liq products of the Fischer–Tropsch process are treated at 500°–1000° F with a basic alkali metal or alkaline earth compound, and the oil fraction separated, vaporized, and treated with a solid adsorbent to adsorb the alcohols and ketones.

U.S.P. 2,653,961 (27.6.49; 29.9.53). H. W. Fleming, assr to Phillips Petroleum Co. The oil phase from the Fischer–Tropsch process is distilled to give a fraction with a f.b.p. in the range 150°–200° C which is contacted with water, separated, and contacted with the aqueous phase from the synthesis process.

U.S.P. 2,653,962 (28.7.51; 29.9.53). R. L. Mitchell and O. V. Luke, assrs to Celanese Corpn. In the liq phase oxidation of aliphatic hydrocarbons part of the reaction mixture is allowed to distil, the condensate is separated into a hydrocarbon phase and an aqueous phase, and while these phases are contiguous, one of them is extracted to remove oxygenated organic compounds therefrom.

U.S.P. 2,653,963 (12.4.51; 29.9.53). F. M. Cowen and J. K. Dixon, assrs to American Cyanamid Co. Halonitriles are made by reacting an olefin and cyanogen chloride or bromide in the presence of a complex of a nitrohydrocarbon with aluminium chloride or bromide or boron trifluoride.

U.S.P. 2,653,965 (21.7.51; 29.9.53). R. M. Thomas, assr to Mathieson Chemical Corpn. Acrylonitrile is made by reacting acetylene and hydrogen cyanide at 80°–90° C in the presence of a mixture of 1·03–1·1 moles of cuprous chloride and 1 mole of an alkali metal chloride in aqueous soln.

U.S.P. 2,653,969 (Switzerland 21.2.47; 29.9.53). O. Allerecht and H. Maeder, assrs to Ciba Ltd. Acrylic acid esters are made by treating acetylene with nickel carbonyl with the addition of an acid and an hydroxy compound.

U.S.P. 2,653,970 (12.1.50; 29.9.53). W. H. Fessler, assr to Allied Chemical and Dye Corpn. Olefin sulphitation process which comprises reacting an olefin of 10–22 carbon atoms, water, a water-soluble volatile alcohol of at least 3 carbon atoms, sodium bisulphite, sodium sulphite, and some of the desired product at a pH of 6–9 while passing oxygen through the mixture.

U.S.P. 2,653,979 (5.11.48; 29.9.53). E. L. Kropa and A. S. Nyquist, assrs to American Cyanamid Co. 1:1-Diarylethanes are produced by reacting an aromatic compound with vinyl acetate in the presence of an alkylation cat. J. M. S.

Ger.P. 878,343, 16.4.53. — Linder, assr to Koppers G.m.b.H., Essen. Process for recovering S from gases containing hydrocarbons.

Ger.P. 878,202, 16.4.53. — Nashan, assr to Bergbau-A.G., Neue Hoffnung, Oberhausen. Process for oxidn of CH_4 and its homologues. (Addn to Pat. 871,445.)

Ger.P. 878,348, 16.4.53. — Dierichs, — Braun, — Dietrich, and — Weber, assrs to BASF, Ludwigshafen (Rhein). Method for continuous production of carboxylic acid esters.

Ger.P. 878,253, 16.4.53. — Daniels, assr to Koppers G.m.b.H., Essen. Installation for producing a suspension of finely divided solids in gaseous media.
BrennstChemie, 1953, **34** (13–14).

Ger.P. 898,587, 22.10.53. — Hagemann, assr to Ruhrchemie A.G., Oberhausen-Holten. Process for coupling gasoline synthesis-CO hydrogenation and town gas production.

Ger.P. 896,981, 8.10.53. — Zachiarassen, assr to Aktiebolaget Separator, Stockholm. Process and plant for centrifugal separation of oils containing H_2O.

Ger.P. 897,548, 15.10.53. — Fischer, — Pichler, and — Ziesecke, assrs to Studien-und Verwertungsges. m.b.H., Mülheim (Ruhr). Process for cat production of preferably liq branched hydrocarbons from CO and H_2. (Addn to Pat. 890,501.)

Ger.P. 897,549, 15.10.53. — Duftschmid, — Linckh, and — Winkler, assrs to BASF. Process for cat conversion of CO with H_2 to hydrocarbons.

Ger.P. 897,698, 15.10.53. — Rottig, assr to Ruhrchemie A.G., Oberhausen-Holten. Process for obtaining CO hydrogenation products with high cont of compounds containing O_2.

Ger.P. 897,701, 15.10.53. — Rottig, assr to Ruhrchemie A.G., Oberhausen-Holten. Process for cat CO hydrogenation using Fe cat.

Ger.P. 898,893, 29.10.53. — Rottig, assr to Ruhrchemie A.G., Oberhausen-Holten. Process for separating aliphatic alcohols from products of cat CO hydrogenation.
BrennstChemie, 1953, **34** (21–22). R. T.

METERING AND CONTROL

626. A new flow meter design. A. L. Jorissen, S. L. Wise, and J. M. Symons. *Petrol. Process.*, 1953, **8** (12), 1870–3.—A new flow meter has been developed that is suitable for the metering of fluids more viscous than water, such as heavy oils and some liq chemicals. The cyl nozzle with conical diffuser, as its name implies, consists of a cyl nozzle placed in the line in the same manner as the simple orifice plate, with a conical diffuser immediately downstream from the nozzle. The addition of this diffuser reduces the non-recoverable head loss by approx 50% for this type of differential producer.
J. W. H.

627. Continuous analysis sampling in petroleum and petrochemical processing. S. B. Spracklen, B. W. Thomas, R. L. Martin, and F. L. Barr. *Oil Gas J.*, 7.12.53, **52** (31), 94.—

Selection of the sampling point, filters to remove solids, scrubbers to remove contaminating gases, use of agglomerators and vaporizers, effect and control of sample temp and flow fluctuations, and control of measuring cell pressure are factors dealt with in this symposium.

2 continuous sample handling systems are described; these provide vapour-phase samples at atm pressure from liq phase streams at high pressure.

Problems met in installing 3 types of sampling systems for analysis instrumentation in commercial petrochemical operations are discussed.

Flow sheets illustrate the script. G. A. C.

628. Patents. U.S.P. 2,637,206 (13.10.49; 5.5.53). E. R. Atkins, assr to Union Oil Co of California. Flowmeter for non-ionizable liq.

U.S.P. 2,637,207 (31.10.49; 5.5.53). D. R. de Boisblanc, assr to Phillips Petroleum Co. Magnetic flowmeter.

U.S.P. 2,637,211 (19.7.51; 5.5.53). J. S. Norman, assr to Standard Oil Development Co. Apparatus for obtaining samples from flowing streams.

U.S.P. 2,637,495 (7.7.48; 5.5.53). F. W. Bubb, assr to Phillips Petroleum Co. Computer for determining the fraction of vapour in a liq–vapour mixture at equilibrium.

U.S.P. 2,638,407 (31.12.49; 12.5.53). A. B. Steeves, assr to Standard Oil Development Co. Apparatus for close temp control of catalysed gas reactions.

U.S.P. 2,638,847 (2.1.47; 19.5.53). G. H. McGowan, assr to Standard Oil Development Co. Ratio drive for metering or proportioning pumps.

U.S.P. 2,639,117 (29.12.47; 19.5.53). R. W. Hogard, assr to Phillips Petroleum Co. Spring closed pivoted gate valve for control of flow of liq.

U.S.P. 2,650,496 (17.5.48; 1.9.53). W. G. Middleton and K. R. More, assrs to Phillips Petroleum Co. Fluid flowmeter with heated resistance bridge circuit.

U.S.P. 2,650,497 (13.2.51; 1.9.53). R. A. Renwarz, assr to Research Corpn. Flexible pitot tube.

U.S.P. 2,650,499 (27.3.50; 1.9.53). H. A. Quist, assr to Sun Oil Co. Sampling adapter for receptacles.

U.S.P. 2,652,716 (G.B. 29.11.48; 22.9.53). J. Blears and J. H. Leck, assrs to General Electric Co. Apparatus for detecting leaks in vacuum systems.

U.S.P. 2,652,721 (18.2.49; 22.9.53). F. L. McMillan and B. F. Wiley, assrs to Phillips Petroleum Co. Fluid flowmeter.

U.S.P. 2,652,846 (22.7.46; 22.9.53). R. V. Dunn, assr to Phillips Petroleum Co. System for regulating the flow of liq A in a pipe in relation to the flow of liq B in a second pipe in response to the weight of a unit of volume of liq C in a third pipe. J. M. S.

Ger.P. 877,961, 16.4.53. — Klein, — Dahm, and — Neweling, assrs to Ruhrchemie A.G., Oberhausen-Holten. Method for determining the filling ht of liq containers.

BrennstChemie, 1953, **34** (13–14).

Ger.P. 894,456, 17.9.53. — Mühlner, Braunschweig. Quantity meter with flask and electromagnetically-controlled valves, *e.g.* for liq power fuels.

BrennstChemie, 1953, **34** (19–20). R. T.

PRODUCTS

CHEMISTRY AND PHYSICS

629. Physical data on hydrocarbons. J. Sherman. *Petrol. Refin.*, 1953, **32** (10), 145–9.—Physical and thermodynamic properties of 935 different hydrocarbons or related compounds have been collected on specially designed punch cards by the API research lab at Carnegie Inst of Technology. Details of the method of recording these properties on the cards are given. R. D. S.

630. Rectification of hydrocarbon gases. K. P. Lavrovskii, A. M. Brodskii, and E. L. Zaitseva. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **90**, 75–8.—Tests made on ethylene, propylene, and mixed *n*-butylenes and also on mixtures of ethylene–propylene in various proportions, to determine desorption (from activated charcoal) kinetics when stripping with N_2 at 395° C at high flow rate (20 m/sec). Results indicate applicability of such procedure, theory of which is discussed, to separation of C_2–C_3 components of cracking gases. V. B.

631. Applying Henry's law to concentrated gas–solvent systems. W. B. Howard. *Petrol. Refin.*, 1953, **32** (12), 97–9. For many gas–solvent systems the usefulness and applicability of Henry's law may be greatly extended by relating the component partial pressure in the gas phase to the mol ratio of that component in solution. The corresponding mathematical relations for the equilibrium ratio values are developed and a method of plotting is suggested. The significance of the equations in chemical engineering practice is demonstrated by several examples. R. D. S.

632. Nature of turbulent combustion. Yu. B. Sviridov. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1953, 1577–97.—Theoretical and mathematical discussion, including consideration of processes occurring in spark-ignition and C.I. engines. V. B.

633. Isomerization of *cyclo*hexane to methyl*cyclo*pentane in the presence of aluminium chloride and under hydrogen pressure. A. F. Plate and L. V. Tarasova. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **89**, 77–80.—Tests at 150°–250° C, using 10% $AlCl_3$ and pressures to 138 atm. Effect of H_2 is to minimize cracking, at 200° C 48% yield (on charge) of methyl *cyclo*pentane was obtained, small quantities of higher mol. wt. (C_7, C_8) homologues of *cyclo*pentane and *cyclo*hexane also formed. V. B.

634. Elementary reactions of atomic oxygen with ethane. L. I. Avramenko and R. V. Kolesnikova. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **89**, 1037–40.—O obtained by discharge through either steam (yielding O, OH, H) or through O_2 (yielding $O + O_2$), tests at 100° C. Reaction products noted in former case are HCHO, EtOH, CH_4, CO, CO_2, C_2H_4, CH_3CHO, organic peroxides; in latter case same except for absence of CH_4, but HCHO–CH_3CHO ratio changed from 15 : 1 to 6 : 1, due to presence of O_2. Detailed results given for tests with O from steam and with inclusion therein of traces of O_2, and reaction mechanisms discussed; shown that CH_3 and C_2H_5, on reaction with O_2, yield HCHO and CH_3CHO. V. B.

635. Kinetics and mechanism of decomposition of propane in presence of added organic molecules. A. D. Stepukhovich and E. S. Shver. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **89**, 1067–70.—Tests on cracking of propane at 620° C and 10 mm under static conditions with addition of propylene and *iso*butylene. Saturation of retarding effect reached at 12% *iso*butylene, propylene half as effective. Greater retarding activity of *iso*butylene due to presence of 2 CH_3 groups, whence H can be broken off, with resultant formation of inactive radical. V. B.

636. Synthesis of 2 : 3 : 4 : 5-tetramethylhexane and 2 : 3 : 5-trimethylheptane. A. D. Petrov, V. M. Melekhin, and V. L. Suschinskii. *Doklad. Akad. Nauk S.S.S.R.*, 1953, **89**, 487–9. Condensation of 3-chlor-2-methyl-butene-1 with Li, Na, or K under various temp conditions was studied; best results with K in Et_2O at 16° C. Diene fraction obtained hydrogenated to yield 76% 2 : 3 : 4 : 5-tetramethylhexane (b.p. $155{\cdot}5_{745}$, n_D^{20} 1·4204, d_4^{20} 0·7494) and 13% 2 : 3 : 5-trimethyl-

heptane (b.p. 158·7$_{740}$, n_D^{20} 1·4169, d_4^{20} 0·7451); Raman spectra of these compounds recorded. Some 3 : 6-dimethyloctane was also produced (11%). V. B.

637. Patent. Ger.P. 894,699, 17.9.53. — Taprogge, Essen-Kupferdreh. Process for self-cleaning of surface condensers. (Addn to Pat. 862,456.)
BrennstChemie, 1953, **34** (19–20). R. T.

ANALYSIS AND TESTING

638. Correlating equilibrium flash vaporization data. Petroleum crudes and fractions. Pt II. E. H. Ten Eyck and D. F. Othmer. *Petrol. Refin.*, 1953, **32** (10), 151–2.—A nomograph based on the correlations discussed in Pt I is presented. From this, if the temp at which a given percentage of the fraction is vaporized at a given pressure is known, the temp for this degree of vaporization can be predicted at any other pressure. Similarly, if the vapour pressure of a pure compound is known at 2 temp it can be predicted at other temp. R. D. S.

639. A direct method for predicting vapour–liquid equilibrium ratios. Pt I. The general method applied to binary systems. J. M. Lenoir and G. A. White. *Petrol. Refin.*, 1953, **32** (10), 121–3. **Pt II. Ternary and multicomponent systems.** *Petrol. Refin.*, 1953, **32** (12), 115–19.—A direct method of computing equilibrium ratios of paraffin and olefin hydrocarbons without the need for a trial and error solution. It consists of first obtaining equilibrium ratios for each component at 10 p.s.i.a. and at the operating temp, then charts are used to determine the convergence pressure of the mixture, and the required equilibrium ratios at the operating pressure are found on generalized charts. Ratios may be determined up to 10,000 p.s.i.a. with accuracy.

The methods described in the first half of this paper are applied to ternary and multicomponent systems by the use of hypothetical binary systems. Values within 6% of the experimental data are obtained. R. D. S.

640. Method for gasoline analysis by hydrocarbon types. L. Robert and A. Crozier. *Rev. Inst. franç. Pétrole*, 1953, **8**, 545–9.—500 ml gasoline fract into 12 cuts using column of min 30 theoret plates and high R.F.R. S.R. gasolines analysed for aromatics by sulphonation and paraffin-naphthenes by an. pt. (nomograph given) of aromatic-free portion. In case of reformed or cracked gasolines olefins determined by bromination (mol. wt. and d table given) and aromatics (+ olefins) by sulphonation, other tests as before. Time of complete analysis is 3 days; experimental details (based largely on IP and ASTM procedures) briefly indicated, and chart showing composition of 5 gasolines given. V. B.

641. Progress Review No. 27 : Temperature measurement. E. J. Burton and D. J. Weeks. *J. Inst. Fuel*, Nov. 1953, **26** (154), 260.—Aspects particularly considered are : the standardization of temp measurement; thermocouples; radiation technique, including new developments in pyrometers; the surface temp measurement of solids; temp measurement during melting processes and temp measurement in flames and gases. Tables are included giving the properties of high temp thermocouples and the properties of radiation receivers. There are 120 literature refs. D. K.

642. Polarographic analysis. A. Poussin. *Rev. Inst. franç. Pétrole*, 1953, **8**, 505–12.—Principles of polarography are explained and equipment used briefly described. Main applications of both inorganic and organic polarography to petroleum analysis outlined. 26 refs. V. B.

643. Patents. U.S.P. 2,644,328 (13.12.48; 7.7.53). S. P. Robinson and R. R. Goins, assrs to Phillips Petroleum Co. Pebble strength testing device.

U.S.P. 2,644,330 (1.3.51; 7.7.53). F. L. Jonach, J. A. Wilson, and J. J. Hiegl, assrs to Standard Oil Development Co. Hydrocarbon fuels are tested for cleanliness by burning the fuel in a burner system under constant conditions of combustion to provide an open flame which is directed into a cooled cyl container I. The combustion products are deposited in I and are dissolved in an organic gum solvent having a Kauri–Butanol value of $\leqslant$100. The wt of deposits dissolved in the solvent and that of those insoluble in the solvent are determined.

U.S.P. 2,645,932 (30.7.49; 21.7.53). F. H. Maclaren, assr to Standard Oil Co. Apparatus for testing plastic flow.

U.S.P. 2,645,935 (6.10.50; 21.7.53). E. M. B. Promuk and F. H. Maclaren, assrs to Standard Oil Co. Beam loader apparatus.

U.S.P. 2,645,949 (9.5.49; 21.7.53). D. R. de Boisblanc, assr to Phillips Petroleum Co. Apparatus for determining v.p. of fluids.

U.S.P. 2,646,678 (2.11.48; 28.7.53). M. B. Standing and J. F. Chittum, assrs to California Research Corpn. Drilling fluid filter loss tester.

U.S.P. 2,653,471 (14.6.48; 29.9.53). D. H. Clewell, assr to Socony-Vacuum Oil Co. Thermo-acoustic gas analyser.

U.S.P. 2,653,473 (29.7.50; 29.9.53). A. L. Simison, assr to Owens-Corning Fiberglas Corpn. Apparatus for determining binder properties of resins. J. M. S.

Ger.P. 878,283, 16.4.53. — Naeser and — Pepperhoff, assrs to Westdeutsche Mannesmannröhren A.G., Düsseldorf and Hüttenwerk Huckingen A.G., Duisburg. Device for determining the true temp of luminous flames from the colour and black temp.
BrennstChemie, 1953, **34** (13–14).

Ger.P. 894,924, 17.9.53. — Ackermann, assr to BASF, Ludwigshafen (Rhein). Process for continuous estimation of oxidizable materials in gases or vapours.
BrennstChemie, 1953, **34** (19–20). R. T.

GAS

644. Gasification conditions in operating built-in gasworks generators with preheated air underfeed. G. Lorenzen. *BrennstChemie*, 1953, **34** (17–18), 281–3; cf. *BrennstChemie*, 1953, (15–16).—Following a general discussion, a new grateless built-in generator is described. The generator, operated with pre-heated air under-firing, utilizes small coke and produces gas of high cal. val. Disadvantages of other types are overcome economically. R. T.

645. Patents. Ger.P. 894,743, 17.9.53. — Markert and — Müller, assrs to BASF, Ludwigshafen (Rhein). Gas producer with cooling ring.

Ger.P. 895,587, 24.9.53. — Schöfl, assr to Didier-Werke A.G., Wiesbaden. Continuous vertical chamber oven.
BrennstChemie, 1953, **34** (19–20). R. T.

ENGINE FUELS

646. Elimination of lead deposits in engine cylinders by the aid of vapours of organic bromine compounds. M. Letort and A. Combre. *Rev. Inst. franç. Pétrole*, 1953, **8**, 491–503.—Continuation of previous work (cf. Abs. 809, 1953), which is summarized; main object of present paper is investigation of reaction mechanism. Tests on 1 : 1 : 2 : 2-tetrabromethane, earlier shown to be most effective of compounds examined. Experimental technique as previously, temp 500°–600° C. Tests made on efficacy of scavenger alone and scavenger + TEL on diminution of pre-existent PbO deposit; formation of $PbBr_2$ therefrom can be both direct from $C_2Br_4H_2$ and by means of intermediate Br compounds formed by decomp of $C_2Br_4H_2$. At least half of $PbBr_2$ obtained is formed by reactions occurring in gas phase (in vapours or dusts). Efficacy of $C_2Br_4H_2$ is not proportional to concn thereof, since there is a considerable horizontal portion on curve relating $PbBr_2$ formed to $C_2Br_4H_2$ concn. V. B.

647. Patents. U.S.P. 2,649,905 (10.3.50; 25.8.53). P. C. Mangan and R. A. Neal, assrs to Westinghouse Electric Corpn. A control device for initiating automatic change-over from a primary fuel system to an emergency fuel system in a turbo-jet power plant.

U.S.P. 2,649,906 (17.3.50; 25.8.53). R. A. Neal and P. C. Mangan, assrs to Westinghouse Electric Corpn. Fuel control selector apparatus for a turbo-jet aircraft engine. D. A. R.

U.S.P. 2,653,862 (3.3.49; 29.9.53). H. M. Trimble, L. A. McReynolds, and B. Mitacek, assrs to Phillips Petroleum Co. Mono*iso*propylamine is used as an octane improver in leaded gasoline. J. M. S.

Ger.P. 894,397, 17.9.53. — Karl and — Hubertus, assrs to Koppers G.m.b.H., Essen. Process for obtaining motor benzol from crude benzol.

Ger.P. 894,744, 17.9.53. — Pec, Wien. Process and device for operating gas burners, etc., with readily volatile, liq fuels.

BrennstChemie, 1953, **34** (19–20). R. T.

GAS OIL AND FUEL OIL

648. The influence of modern refinery technique on marine fuel oil quality. C. W. G. Martin. *Petrol. Times*, 25.11.53, **57** (1471), 1267.—Extracts are given from a paper read to the Institute of Marine Engineers, London, on 8.12.53. Commencing with a brief review of the history of fuel oils, the paper continues with an appraisal of the cat cracking processes, and their effect on fuel oil quality. "Quality" itself is discussed; then calorific values, asphaltene, and ash contents.

Experiments are described in the use of additives, carried out at sea, and the point is made that additives have not as yet proved their economic advantage. G. A. C.

649. Patent. U.S.P. 2,650,187 (15.11.50; 25.8.53). E. C. Daigle, assr to Socony-Vacuum Oil Co. A method for reducing sedimentation and stabilizing the colour of a dist type fuel oil boiling between *ca* 300° and 700° F, which comprises liq phase contacting of the oil with a polyethylene glycol characterized by a mol. wt. of at least *ca* 600 and substantially complete solubility in water. D. A. R.

LUBRICANTS

650. Modern grease plant goes on stream. C. O. Rinearson and C. W. Nofsinger. *Petrol. Refin.*, 1953, **32** (10), 155–7.—British American Oil Co's grease plant at Clarkson refinery, Toronto, went on stream in April. Special features include a centralized control room from which the weighing of the materials is controlled; a gas-fired furnace (thermal efficiency 80%) for heating the oil which heats the jacketed pans, which may operate under vacuum or pressure; and a high capacity colloid mill feeding a dehydrator-de-aerator. Production rate is 60,000 lb/day. R. D. S.

651. Synthetic lubricating oils. J. R. Jurado. *Combustibles* (*Zaragoza*), 1953, **13**, 167–75.—Preliminary work on lub oil syntheses by Friedel-Crafts condensation of chlorinated paraffin waxes with aromatic hydrocarbons. Raw materials are petroleum slack wax containing 25% oil and commercial xylol containing approx 20% vol of toluol. Lub oil products 80–90 V.I., considered of satisfactory stability, but dewaxing or addition of pour point depressant necessary. Work then extended to indigenous starting materials, (*a*) soft wax deriving from Coruña lignite tar, and (*b*) fraction boiling up to 210° C from same lignite tar, this fraction, after removal of unsaturateds, containing 45% aromatics. Yield of synthetic lub oil was 80% of the original hydrocarbons, visc at 210° F 50 cs, V.I. 92. A. C.

652. Investigation of anti-wear properties of lubricating oils by the radio-active indicator method. Yu. S. Zaslavskii, G. I. Shor, and F. B. Lebedeva. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1953, 1598–1608.—Tests on friction machine (using insert of Co^{60}) and on single-cyl spark ignition engine (using activated compression ring, either galvanized with Zn^{65} or irradiated to form Fe^{59}). Friction machine tests show good reproducibility, and will indicate difference between oils after 1 hr, using 80 ml sample. Results, by both methods, given on a number of Russian lub oils; effect of additives also examined on friction machine, of these paranox was the most effective. Results are expressed as tan angle of slope of line obtained by plotting radio-activity of oil against test duration. V. B.

653. Patents. U.S.P. 2,651,616 (G.B. 20.4.50; 8.9.53). J. B. Matthews, D. Evans, J. F. Hutton, and J. O. Cliffe, assrs to Shell Development Co. Lubricating greases are made by heating a lub oil with alkali metal aliphatic monocarboxylic acid soaps containing at least 35% lithium hydroxy fatty acid soaps until a homogeneous composition is formed, cooling to a temp between 110° and 170° C at a rate between 1° and 3° C/min, isothermally gelling the composition at such temp, and subsequently cooling the grease.

U.S.P. 2,651,628 (26.9.50; 8.9.53). L. M. Welch, assr to Standard Oil Development Co. Pour point depressants for waxy mineral lub oils are made by dissolving polystyrene (mol. wt. 25,000–45,000) in tetrachloroethylene, monochlorobenzene, *o*- or *p*-dichlorobenzene, nitrobenzene, or carbon disulphide, adding a Friedel–Crafts cat, slowly adding a straight chain alkene of 16–20 carbon atoms, and reacting at 30°–75° F to produce a product having a mol. wt. 6000–18,000 Staudinger.

U.S.P. 2,651,657 (21.5.49; 8.9.53). L. A. Mikeska and L. T. Eby, assrs to Standard Oil Development Co. Synthetic lub oils of the formula $[R(-O\cdot CR'H\cdot CR''H-)_nO]_4CO$, where R is an alkyl group of 1–10 carbon atoms, R′ and R″ are hydrogen atoms or methyl groups, one being hydrogen and the other methyl in each radical, and n is an integer from 8 to 20.

U.S.P. 2,652,361 (29.12.51; 15.9.53). H. A. Woods and L. C. Bollinger, assrs to Shell Development Co. Gasoline-resistant grease comprising a water-sol polyoxyalkylene fluid, a partial ester of a polyhydric alcohol having from 2 to 10 carbon atoms with a higher fatty acid, and 5–25 wt % of an inorganic colloidal gel.

U.S.P. 2,652,362 (15.8.50; 15.9.53). H. A. Woods and R. C. Jones, assrs to Shell Development Co. Grease comprising a lub oil, a gelling agent, and 0·01–5% each of a naphthylamine and a reaction product of phosphorus pentasulphide and a dicyclic terpene.

U.S.P. 2,652,363 (29.12.51; 15.9.53). H. A. Woods and L. C. Bollinger, assrs to Shell Development Co. Gasoline-resistant grease comprising 20–50 wt % of a water-sol polyoxyalkylene fluid, 30–60 wt % of a partial ester of a polyhydric alcohol having less than 6 carbon atoms with a higher fatty acid and a gelling amount of a hydroxyalkylamine soap of a higher fatty acid. J. M. S.

U.S.P. 2,652,364 (29.12.51; 15.9.53). H. A. Woods and L. C. Bollinger, assrs to Shell Development Co. Grease comprising, as the lubricating base, a mixture of 55–95 wt % of a polyhydrocarbylsiloxane having a visc in the lub oil range and 5–45 wt % of a mineral oil having a visc between 1250 and 11,000 SUS at 100° F and containing <15 wt % aromatics, and, as the gelling agent, a sodium soap of a carboxylic acid having <20 carbon atoms, and also containing an alkali metal salt of a carboxylic acid containing an aromatic ring.

U.S.P. 2,652,365 (24.6.49; 15.9.53). R. J. Moore and J. N. Wilson, assrs to Shell Development Co. Greases are made by mixing an oil having a visc >500 SUS at 100° F with an amount of gelling agent (A) so that A comprises 10–50% of the mixture, heating until homogeneous, cooling to below 100° C, and mixing into the grease an oil having a visc <300 SUS at 100° F until the content of A is 5–15 wt %.

U.S.P. 2,652,366 (15.8.50; 15.9.53). R. C. Jones and R. J. Wall, assrs to Shell Development Co. Greases are made by heating a mixture of a lub oil and a gelling agent to the soln temp (T_1), quenching the mixture in <1 min to a temp (T_2) between 25° and 55° F lower than T_1 without any shearing, and finally shearing at T_2 to form a grease.

U.S.P. 2,652,367 (5.8.50; 15.9.53). D. E. Adelson, assr to Shell Development Co. Lubricants are stabilized against deterioration by adding a product obtained by reacting a ketone or aldehyde with an alkylene polyamine in the mol ratio 2 to 6 : 1 to 3 and at 50°–250° C until water formation ceases, and treating the product with a phosphorus sulphide, a sulphur halide, or sulphur in the mol ratio 1 : 1 to 1 : 8 at 0°–175° C for 3–24 hr.

U.S.P. 2,652,368 (21.6.49; 15.9.53). D. S. Melstrom and F. J. Watson, assrs to Shell Development Co. V.I. improvers for hydrocarbon lub oils are copolymers of cracked wax olefins and SO_2 having a mol. wt. between 5000 and 100,000.

U.S.P. 2,652,369 (27.11.50; 15.9.53). J. E. Fields, assr to Monsanto Chemical Co. Liq addition products of acetals and dialkyl esters of $\alpha\beta$-unsaturated aliphatic dicarboxylic acids are used as anti-foaming agents for hydrocarbon oils.

U.S.P. 2,652,370 (20.4.51; 15.9.53). T. G. Wisherd, assr to Sinclair Oil and Gas Co. Soap-thickened pet gels are broken by addition of an agent produced by the sulphonation and neutralization of the bottoms produced in the manufacture of dodecylbenzene.

U.S.P. 2,653,131 (29.3.51; 22.9.53). R. O'Halloran, assr to Standard Oil Development Co. Grease made by mixing 1·5–10 wt % of an aluminium soap of a high mol. wt. saturated fatty acid in a mineral oil, heating to disperse the soap in the oil, cooling below the transition temp of the soap, adding 3–30 wt % of amorphous carbon black and working until the desired consistency is obtained.

U.S.P. 2,653,132 (17.12.49; 22.9.53). A. J. Morway and P. V. Smith, assrs to Standard Oil Development Co. Bottoms from the OXO process are used as the base oil for lithium soap greases.

U.S.P. 2,653,133 (7.12.50; 22.9.53). W. E. Catlin, assr to E. I. du Pont de Nemours and Co. Lub oil containing 0·1–10 wt % of an oil-soluble copolymer of acrylonitrile or methacrylonitrile and an alkyl ester of acrylic or methacrylic acid. The copolymer contains 2–20 wt % of the nitrile, and the esters have 10–18 carbon atoms in the alkyl group.

U.S.P. 2,653,517 (29.5.51; 29.9.53). R. J. S. Pigott, assr to Gulf Research and Development Co. Method of applying cutting liq.

U.S.P. 2,653,909 (28.12.49; 29.9.53). D. Frazier, assr to Standard Oil Co. Maching oil comprising an emulsion of water with an oil prepared by oxidizing a refined lub oil having a visc of 75–600 SUS at 100° F and an ASTM aniline point of at least 105° C, and neutralizing with a strong base dissolved in a mutual solvent for the base and the soap formed.

U.S.P. 2,653,910 (G.B. 16.2.50; 29.9.53). R. S. Airs and V. W. David, assrs to Shell Development Co. Trithiones are used as E.P. additives for lub oils.

U.S.P. 2,653,911 (1.2.52; 29.9.53). J. E. Fields and T. M. Patrick, assrs to Monsanto Chemical Co. Liq of the formula $R{\cdot}CO[CH(COOR')CH(COOR'')]_nH$, wherein R is an alkyl radical of 1–12 carbon atoms, R′ and R″ are alkyl, *cyclo*alkyl, aryl, alkaryl, or aralkyl radicals of 1–18 carbon atoms and n is greater than 1, are used as anti-foaming agents for hydrocarbon oils. J. M. S.

Ger.P. 895,588, 24.9.53. — Kolbel and — Meusel, assrs to Rheinpreussen A.G. für Bergbau und Chemie, Homberg (Ndrh). Method for producing lub oils.
BrennstChemie, 1953, **34** (19–20). R. T.

BITUMEN, ASPHALT, AND TAR

654. Asphalt quality test. R. E. Weaver and M. M. Gilkeson. *Petrol. Refin.*, 1953, **32** (10), 153–4.—A simple cup viscometer may be used for a rapid high temp test of asphalt quality which may be carried out at the unit site. The time of efflux may be correlated with standard penetration test values as shown by the specimen correlation given. R. D. S.

655. The extra dividends of asphalt overlay pavements. J. M. Griffith. *Rds & Str.*, 1953, **96** (10), 94.—Deficiencies in cracked highway surfacings may often be overcome in an economical way by applying an asphalt overlay. In this way many further years of life may be obtained. Not only are the surface defects eliminated, but increased load bearing capacity is also achieved. Such overlays may be applied to existing flexible or rigid constructions. The U.S. Corps of Engineers procedure for designing overlays for flexible construction is based upon the C.B.R. Test, and details of this method are given. The design of overlays for rigid pavements is not so simple, and has involved considerable investigation, which is described. R. H.

656. Patents. U.S.P. 2,651,619 (25.1.51; 8.9.53). V. F. B. de Mello, E. A. Hauser, and T. W. Lambe, assrs to Research Corpn. Stabilizing soil by mixing it with a monomeric water-sol acrylate of a polyvalent metal and a reduction-oxidn cat, forming the mixture into the desired structural form, and then polymerizing the acrylate in the presence of sufficient moisture to at least partially ionize the acrylate and cat.

U.S.P. 2,652,341 (25.3.50; 15.9.53). W. G. Craig, assr to Lubrizol Corpn. Alkali metal paraffin wax hydroxy phenylsulphonates are added to stable clay bitumen-in-water emulsions.

U.S.P. 2,653,878 (Norway 20.11.48; 29.9.53). J. Sejersted and O. C. Bockman, assrs to Elektrokemisk A.S. Bituminous pitch is mixed with calcined pitch coke, petroleum coke, or purified anthracite for the production of electrodes. J. M. S.

Ger.P. 895,455, 24.9.53. — Eymann, assr to Stadtwerke Düsseldorf, Düsseldorf. Process for dehydrating tar.
BrennstChemie, 1953, **34** (19–20). R. T.

SPECIAL HYDROCARBON PRODUCTS

657. Patents. U.S.P. 2,649,467 (Sweden 5.4.49; 18.8.53). B. Bræe, assr to AB. Seperator-Nobel. A process for extracting components relatively rich in hydrogen from mineral oils which comprises contacting the oil with a perfluorinated hydrocarbon as a solvent to produce a raffinate phase containing mainly the components relatively poor in hydrogen and an extract phase containing mainly the components relatively rich in hydrogen. D. A. R.

U.S.P. 2,650,876 (1.2.50; 1.9.53). W. D. Stewart, assr to B. F. Goodrich Co. Insecticidal and fungicidal composition comprising an O-alkyl N : N-dialkyl thiocarbamate and a carrier.

U.S.P. 2,650,892 (7.12.51; 1.9.53). G. M. Le Fave, assr to J. I. Holcomb Manufacturing Co. Alkyl monoamine salts of pentachlorophenol are used as miticides.

U.S.P. 2,650,893 (2.12.50; 1.9.53). H. G. Walker, assr to Pennsylvania Salt Manufacturing Co. Composition for wood preservation comprising dimethyl tetrachlorophthalate, water, and an organic solvent.

U.S.P. 2,651,579 (12.8.46; 8.9.53). R. E. Plump, assr to Pennsylvania Salt Manufacturing Co. Halogenated thiophenes are used as pesticides.

U.S.P. 2,651,590 (13.4.51; 8.9.53). K. S. Karsten, assr to R. T. Vanderbilt Co. Compounds of the formula $XYC(COOR)_2$, wherein X is bromine or chlorine, Y is hydrogen, bromine, or chlorine, and R is an alkyl group of 1–4 carbon atoms, are used as pesticides.

U.S.P. 2,652,322 (3.1.51; 15.9.53). R. M. Hedrick and D. T. Mowry, assrs to Monsanto Chemical Co. Compositions comprising a herbicide and a water-sol polyelectrolyte which is a polymer of at least one compound containing the grouping $H(CH_2)_nCCO-$ (with CH_2 above the C).

U.S.P. 2,652,323 (3.1.51; 15.9.53). D. T. Mowry and R. M. Hedrick, assrs to Monsanto Chemical Co. Composition comprising 0·05–20 wt % of a herbicide and 80–99·95 wt % of a water sol copolymer having recurring units of the structure —CH(COX)—CH(COY)—CZZ′—CZ″Z‴—, wherein X and Y are —OK, —ONa, —ONH_4, —$ONRH_3$, —ONR_2H_2, —ONR_3H, —ONR_4, —OH, —NH_2, —OR, —OCH_2NR_2, —$OCH_2CH_2NR_2$, —$NCH_2CH_2NR_2$, —NHR or —NR_2, not more than one of the X and Y radicals being —OR, Z, Z′, Z″, and Z‴ are —C_6H_5, —OCOH, —$OCOCH_3$, —OR, —COOR, —COOH, —CH_3, —OH,Cl, or H, at least two of said groups being H, and R is an alkyl group of up to 4 carbon atoms. X and Y may together be —O— or —O—Ca—O—.

U.S.P. 2,652,337 (19.1.50; 15.9.53). J. A. Pianfetti, R. Melvin, and H. H. Earle, assrs to Food Machinery and Chemical Corpn. Volatile fumigant comprising 75–98 wt % of a liq chlorinated hydrocarbon of ≥ 2 carbon atoms and 2–25 wt % of bromotrichloromethane or dibromodichloromethane.

U.S.P. 2,652,355 (31.1.50; 15.9.53). N. Ercoli and G. van Wessen, assrs to Warner–Hudnut Inc. Fungicidal composition comprising γ-(*p*-bromphenoxy)propyl thiocyanate and a carrier.

U.S.P. 2,653,864 (26.12.51; 29.9.53). A. H. Schlesinger, assr to Monsanto Chemical Co. Fluorenone and its alkyl derivatives are used as herbicides.

U.S.P. 2,653,865 (25.8.50; 29.9.53). M. Kosmin and A. H. Schlesinger, assrs to Monsanto Chemical Co. Benzothiazole and its 2-chloro- and 2-bromo- derivatives are used as herbicides.

U.S.P. 2,653,866 (22.3.51; 29.9.53). D. T. Mowry and A. H. Schlesinger, assrs to Monsanto Chemical Co. Alkyl furfurylidenecyanoacetate is used as a herbicide.

U.S.P. 2,653,894 (29.12.48; 29.9.53). M. S. Newman and W. B. Wheatley, assrs to the U.S.A. (Secretary of the Army). Trimethyloctenediols in which the hydroxy groups are attached to methyl-substituted carbon atoms on either side of the double bond are used as insect repellents.

U.S.P. 2,653,895 (11.1.49; 29.9.53). N. L. Drake and S. Melamed, assrs to the U.S.A. (Secretary of the Army). The butyl ester of N-benzylglycine is used as an insect repellant.

U.S.P. 2,653,896 (10.2.51; 29.9.53). E. B. Hodge, assr to Commercial Solvents Corpn. 1-(4-chlorophenyl)-1-(2 : 4-dichlorophenyl)-2-nitro-propane or -butane is used as an insecticide.

Ger.P. 894,555, 17.9.53. — Wolter and — Mannes, assrs to Henkel & Cie. G.m.b.H. Method for producing valuable compounds containing O_3.

Ger.P. 895,445, 24.9.53. — Bähr, assr to BASF, Ludwigshafen (Rhein). Method for producing unsaturated compounds.

Ger.P. 895,447, 24.9.53. — Krekeler and — Leutner, assrs to BASF, Ludwigshafen (Rhein). Method for producing butadiene from dichlorobutane.

Ger.P. 895,766, 24.9.53. — Krekeler and — Leutner, assrs to BASF, Ludwigshafen (Rhein). Method for producing butadiene.

BrennstChemie, 1953, **34** (19–20).

Ger.P. 897,573, 15.10.53. — Grosskinsky and — Klempt, assrs to Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik G.m.b.H., Dortmund-Eving. Method for producing nitrogenous humus fertilizer.

BrennstChemie, 1953, **34** (21–22). R. T.

DERIVED CHEMICAL PRODUCTS

658. An overall picture of the petrochemical industry. Anon. *Petrol. Refin.*, 1953, **32** (11), 104-7.—In 1952 the U.S. petrochemical industry produced 21% of all chemicals in the U.S.A., and this is expected to rise to 50% by 1965. This is largely due to its preponderance in the aliphatic field, producing 80% of the national total in 1952. An outline of the development of the industry is given and an analysis of the product uses made, showing the synthetic rubber industry as the largest single user, taking 20% of the total. R. D. S.

659. Petrochemical processes. Anon. *Petrol. Refin.*, 1953, **32** (11), 118–95.—Brief descriptions and simple flow diagrams are given for 64 petrochemical processes for the production of aliphatic, aromatic, and inorganic chemicals and some end-products, *e.g.* plastics and synthetic rubbers. R. D. S.

660. Understanding the chemistry of petrochemical reactions. Pt VI. Nitration and sulphonation of paraffin and aromatic hydrocarbons. L. F. Hatch. *Petrol. Refin.*, 1953, **32** (10), 129–32.—The reactions are described, and an outline of the product uses given. R. D. S.

661. What's unique about Tuscola? Anon. *Petrol. Process.*, 1953, **8** (12), 1889–91.—The new $50 million plant of National Petro-Chemicals Corpn extracts ethane from natural gas, cracks it to ethylene, and then uses the ethylene as a building block for making ethyl alcohol and ethyl chloride. A small amount of by-product di-ethyl ether is recovered in conjunction with the alcohol operation. The unit for cracking the ethane to ethylene has a capacity of 200 million lb a year.

A polyethylene plant and an ammonia plant are planned for the future at the Tuscola petrochemical plant. J. W. H.

662. Hydrocarbon recovery at Tuscola. J. F. McDonald. *Petrol. Process.*, 1953, **8** (12), 1895–6.—The new hydrocarbon extraction unit at the National Petro-Chemicals Corpn plant at Tuscola is a double oil absorption system. The recovery units have been designed to handle 425 million cu. ft. gas per day, and from this the absorbers will extract 10 million cu. ft. of ethane (40% being present in the initial wet gas), together with smaller amounts of propane and butane.

A flow diagram of the hydrocarbon extraction unit is given. J. W. H.

663. Patents. U.S.P. 2,649,406 (14.3.52; 18.8.53). J. M. Harrison and A. E. Somers, assrs to Gulf Research and Development Co. A process which comprises adding chloroform to a mixture of acetone and propionaldehyde, dist the resulting mixture of acetone, propionaldehyde, and chloroform, removing propionaldehyde overhead as product, and removing as bottoms a mixture containing azeotropic amounts of acetone and chloroform. D. A. R.

Ger.P. 877,899, 16.4.53. — Hoffmann, — Franke, and — Weissbach, assrs to Chemische Werke Hüls G.m.b.H., Marl. Method for producing alcohols of the acetylene series.

Ger.P. 878,349, 16.4.53. — Hentrich, — Riehen, — Basel, and — Olsen, assrs to Deutsche Hydrierwerke A.G., Düsseldorf. Method for producing hydroaromatic carboxylic acids.

BrennstChemie, 1953, **34** (13–14). R. T.

COAL, SHALE, AND PEAT

664. Oil from coal in South Africa. Anon. *Petrol. Times*, 11.12.53, **57** (1470), 1223.—This is a general review of the "Sasol" project which employs both German and American developments of the Fischer–Tropsch process.

Nine Lurgi synthesis gas generators with a combined output of 4·5 million cu. ft/hr are used, and immediate by-products include benzol, xylene, toluene, crude tar acids, creosote, and raw material for making ammonium sulphate. By-products include alcohols, acetone, and M.E.K. G. A. C.

665. Chemistry and petrography of ion-exchangers from brown and mineral coal. Pt I. Chemistry of the ion exchangers from coals. H. Stach and M. Teichmüller. *BrennstChemie*, 1953, **34** (17–18), 275–81. **Pt II. Petrographic investigations of ion-exchangers and their original coals.** *BrennstChemie*, 1953, **34** (21–22), 333–6. **Pt III. Increase in reflection of the coals in exchange activation in comparison with that in natural carbonization.** *BrennstChemie*, 1953, **34** (21–22), 337–8.—After a review of constitutional requirements in ion-exchangers, brown and mineral coals are shown to be converted by fuming H_2SO_4 into cation exchangers, which fulfil the required conditions. Effect of H_2SO_4 treatment is not limited to the introduction of the exchange-active sulphonic acid groups, but conc H_2SO_4, at the same time, has a gelling, condensing, and finally an oxidizing effect on the humus substance. The polycondensation processes initiated by H_2SO_4 lead to desired macromolecular structures in the transformation products. By the oxidizing effect of fuming H_2SO_4 carboxyl groups are newly formed in mineral coals, which, in contrast to brown coals, exhibit no naturally formed carboxyl groups. A quant method for estimating both acid groups together is given, which shows that, in brown coal exchangers carboxyl groups, and in the more carbonized mineral coals activated to the ion-exchange, sulphonic acid groups predominate. The tech possibilities of introducing ion-exchangers in different water treatment processes are discussed, and exchange capacities attainable thereby are given. Comparative microscopic investigations of the original coals and their ion-exchangers show that strong gelling of the coal grain occurs on sulphonation. Also the reflective power of the humus and bituminous constituents increases. These changes always become smaller with increasing carbonization; they are very strong in brown coals, relatively weak in fat coals. With anthracite a reversal occurs. The chem and optical changes on sulphonation are compared with those in the natural carbonization. The different possible causes for the reflection rise in the natural carbonization and on sulphonation are discussed. In agreement with van Krevelen it is assumed that the aromatic portion and the magnitude of the cyclic systems influence the reflective power of coals.

(Author's abstract.) R. T.

666. Patents. Ger.P. 878,333, 16.4.53. — van Ackeren, assr to Koppers G.m.b.H., Essen. Discharge device for vertical low-temp carbonizing furnace heated with rinsing gas, etc.

Ger.P. 878,042, 16.4.53. — Hingst, Kassel-Wilhelmshöhe. Process for low-temp dist of coals with flue gases or other heated gases or vapours. (Addn to Pat. 871,741.)

BrennstChemie, 1953, **34** (13–14). R. T.

Ger.P. 894,546, 17.9.53. — Stäckel, assr to Otto & Comp. G.m.b.H., Bochum. Coke oven battery. (Addn to Pat. 867,240.)

Ger.P. 894,547, 17.9.53. — Schäff, assr to Steinkohlen-Elektrizität A.G., Essen. Process for low-temp carbonization or degassing of coal.

Ger.P. 894,838, 17.9.53. — Junkermann, assr to A.G. für Unternehmungen der Eisen- und Stahlindustrie, Essen. Heating chambers for low-temp carbonization plant after heating surface low-temp procedure.

Ger.P. 895,144, 24.9.53. Bergbau-A.G. Ewald-König Ludwig, Herten (Westf). Procedure for improving the yield of hydrocarbons in thermal treatment, *e.g.* in coking bituminous fuels.

BrennstChemie, 1953, **34** (19–20). R. T.

CORROSION

667. Worthite. W. E. Pratt. *Chem. Engng*, 1953, **60** (11), 264–78. **Durimet 20—Carpenter 20.** W. A. Luce. *Chem. Engng*, 1953, **60** (12), 276–88. **High silicon irons.** W. A. Luce. *Chem. Engng*, 1954, **61** (1), 246–60.—The corrosion resistance of these important materials of construction to a number of corrosives, with physical properties and applications in industry. D. M.

ENGINES AND AUTOMOTIVE EQUIPMENT

668. Variable piston application to petrol engines. Anon. *Mech. World*, Nov. 1953, **133** (3412), 492.—The principle of operation of the BICERA variable ratio piston is described and illustrated. The piston is composed of an inner portion over which slides a shell, the parts being so designed that 2 chambers are formed, both of which are filled with lub oil supplied from the engine oil system via the connecting rod. Variation of max cyl press automatically varies the C.R. Pistons of this type have been fitted to a 6-cyl, 1·5-litre car. T. T.

669. Hydraulic servo-operated fuel injection system. Anon. *Mech. World*, Nov. 1953, **133** (3412), 493.—To avoid high fluctuating loads on driving gears of pump plungers the following system was devised. A gear pump driven from the crankshaft supplies fuel oil at 1000 p.s.i. to an accumulator arranged near each pump, compressing air separated from the oil by a flexible diaphragm. A balanced piston valve allows the air to re-expand, forcing the oil into a chamber where it acts on a piston connected to the injection pump plunger, the injection pump proper being of conventional design. Advantages of this system are listed, and the fuel system and a proposed design of injection pump for this system are illustrated. T. T.

670. Patents. U.S.P. 2,651,173 (26.1.49; 8.9.53). H. L. Thwaites and B. R. Russell, assrs to Standard Oil Development Co. Ram-jet and gas turbine engines are fitted with a spark plug adjacent the fuel inlet and an oxygen supply means which feeds oxygen to the combustion chamber only when the spark plug is operating to initiate combustion.

U.S.P. 2,651,176 (17.8.46; 8.9.53). J. I. Yellott, assr to Bituminous Coal Research Inc. Coal-fired gas turbine power plant.

U.S.P. 2,651,197 (16.12.50; 8.9.53). R. R. Crookston and J. S. Waters, assrs to Standard Oil Development Co. Torque indicating and shock absorber device.

U.S.P. 2,652,719 (23.9.50; 22.9.53). D. Bracci. Apparatus for testing the fuel consumption of motor vehicles.

U.S.P. 2,652,926 (26.9.49; 22.9.53). P. S. Jernigan. Water discharge fitting for fuel tanks on motor vehicles.

U.S.P. 2,653,116 (16.3.49; 22.9.53). K. R. Whitcomb and E. E. Finch, assrs to Cee-Bee Chemical Co. Method of removing the sealant from aircraft fuel tanks.

U.S.P. 2,653,472 (6.3.50; 29.9.53). C. R. Gibson. Power indicating instrument for I.C. engines.

U.S.P. 2,653,477 (29.12.49; 29.9.53). E. E. Hoskins. Liquid level gauge for crankcases of I.C. engines. J. M. S.

MISCELLANEOUS

671. What's the picture for '54? Anon. *Petrol. Process.*, 1953, **8** (12), 1863–5.—2 important developments will influence refinery operations in 1954; these are, the need for the industry to balance crude runs to stills to bring product stocks more into line with demand, and the manufacture of higher octane motor fuels through more intensive use of cat reforming. Excess refining capacity in the U.S.A. is slowly building up, and is expected to reach 1,200,000 b.d. by the end of 1954. J. W. H.

672. Predecessors of petroleum refining in Russia and the initial period thereof. S. R. Sergienko. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1953, 1649–59.—Development of wood distn industry in Russia indicated procedures applicable to pet processing. Evidence is quoted for existence of small plants producing illuminating kerosine in 1745, 1823, and 1836. Illustrations. V. B.

673. Fuel problems of jet aircraft. Anon. *Petrol. Times*, 11.12.53, **57** (1470), 1237.—Extracts are given from articles of "The Napier Nomad Compound Diesel Aero Engine" and "Fuel for Jet Transports," the cost factor being stressed. It is estimated that the numbers of pure jet and turbo-prop engines will not exceed 500 in the years 1960–62, consuming about 125,000 brl daily of fuel. G. A. C.

674. Study in conservation of fuel. Anon. *Petrol. Times*, 11.12.53, **57** (1470), 1235.—The Productivity Report on the Conservation of Fuel, Heat, and Energy by the specialist team which visited the U.S.A. in 1952 is reviewed, but there are few references to oil in the report. G. A. C.

675. Atomization and the performance of oil burning equipment. C. S. Darling. *Mech. World*, Nov. 1953, **133** (3412), 486.—The principle of swirl atomizers is given, and various types are described and illustrated. Causes of defective atomization are discussed. Details of 4 types of variable output nozzles are given. 8 refs. T. T.

676. French power resources and their utilization. J. Couture. *J. Inst. Fuel*, 1954, **27** (156), 3.—The available power resources of France and their utilization are reviewed. France has poor fuel resources and consequently imports are necessarily high. Petroleum, coal, gas, and electricity are discussed. A brief description is given of steps taken in France to utilize fuel as rationally as possible. There are 14 literature refs. The appendices include: (1) a brief description of the French coalfields; (2) preparation of fuel, coal washing; (3) plant for the production of electric power in France. D. K.

677. Brittle failure of nonship steel-plate structures. M. E. Shank. *Mech. Engr*, Jan. 1954, **76** (1), 23.—Cases of brittle failure of miscellaneous steel structures are reviewed, and conclusions to be drawn from them are given. Failure of 3 unused, empty oil-storage tanks are mentioned, and the brittle failure of high pressure gas transmission lines is discussed. Conditions under which a carbon-steel plate will fail in a brittle manner are stated, and the author concludes that there is no known test which will indicate the susceptibility of a material to this type of failure. T. T.

678. Continuous wax moulding. R. Shannon. *Mech. Engng*, Dec. 1953, **75** (12), 963.—A wax-moulding plant has been devised, capable of continuously moulding petroleum waxes into slabs, packaging the slabs into cartons, marking the cartons and delivering them to freight cars or trucks. The equipment is fully described, and illustrations of the moulding apparatus are included. Optimum output is 12,500 lb of wax/hr, when producing 11-lb slabs. Operation of the plant is described and the problems encountered and the modifications carried out are discussed. Max output of 1785 lb of wax per manhour as against 466 for the batch process is claimed. Slabs are more uniform in weight (less than 1 oz variation per slab) and have a better appearance. T. T.

679. Ignacy Lukasiewicz. J. Pilecki. *Nafta* (*Krakow*), 1953, **9**, 165–9.—Commemorative article on the "father" of Polish petroleum industry. His achievements included the supply of paraffin lamps and ½ ton of kerosine to Lwów hospital in 1853. M. S.

680. 100 years of development of science and technique of petroleum. J. Wojnar. *Nafta* (*Krakow*), 1953, **9**, 169–78.—Reviews Polish contributions during the years 1853–1953 and development of Polish industry 1944–53. The latter includes the modernizing of all equipment, *e.g.* change over from percussion to rotary drilling, use of electrical power instead of combustion of natural gas in the oilfields, repressurizing and secondary production which yield most of present supplies of crude, gas pipelines to Warsaw and other cities, introduction of modern refining methods and construction of new refineries, as well as expansion of teaching of Petroleum Science at primary, secondary, and higher educational levels. The 6-year plan which ends in 1955 should provide 394,000 tons of crude p.a. and 480,000,000 cu. m. of natural gas p.a. M. S.

681. Present day problems of (Polish) petroleum industry in connection with a history of its existence. J. Drzewiecki. *Nafta* (*Krakow*), 1953, **9**, 179–82.—Author briefly reviews the 100 years of Polish petroleum industry and deals at length with problems of the present and the future. M. S.

682. Activity of Petroleum Workers Union during last 2 years. S. Wais. *Nafta* (*Krakow*), 1953, **9**, 197–203.—Activity was directed towards helping the industry to reach its targets by means of internal discipline during work and by lectures. The Union favours employment of women at nearly all stages. Young employees have shown themselves capable, and there is need for education of all workers. Great savings were made by employees' inventions, progress maintained by competition, leadership, and high daily targets. The Union sponsored health service, sport activities, and pressed for good living conditions. M. S.

683. Inventiveness in (Polish) petroleum industry—Conference 28th June. I. Lasek. *Nafta* (*Krakow*), 1953, **9**, 204.—A report showing how the savings due to small inventions rose from *ca* £99,000 in 1949 to *ca* £104,000 for the first quarter of 1953. M. S.

684. Foreign review—petroleum in Chinese People's Republic. Anon. *Nafta* (*Krakow*), 1953, **9**, 159–60.—Up to now ancient resources of Shensi, Kansu, Sinkiang, and Chinhai could only supply local needs. China was a market for English and American firms and purchased products to the value of $3270 million over last 40 years. Since 1949 production rose by 35% each year whilst in 1951 refining rose to 150% of the 1949 level. In 1952 indigenous crude and other mineral oils supplied nearly all the needs of the country. Prices were cut by 10% in Dec. 1951. By 1950 600 qualified technologists were available to the petroleum industry. Instructors and equipment came from the U.S.S.R. The number of geologists was trebled in 2 years. Search proved that oil bearing areas in Shensi, Kansu, Sinkiang, and Sechwan are larger than expected and others exist in Chekian, Hsi-Kan, Kweichoo, and in Yangtse delta. Exploratory drilling reached 3000 m in 1949, 6000 m in 1950, 10,000 m in 1951; more than 10 refineries are being constructed. In Kansu winter drilling goes on, in Yunnan 100,000 tons were produced in 1950, pipeline is now running to Lenchu, and will extend to the nearest railway point soon. Soviet–Chinese Company is exploiting in Sinkiang, which has richest deposits of crude. In Shensi oil has been found in Yengping, Yunchang, and Yunnan. Bituminous shale production in 1952 is 30% higher than under Japanese occupation. Petrochemical and allied industry is developing swiftly. M. S.

BOOK REVIEWS

The Permian Reef Complex of the Guadalupe Mountains Region, Texas and New Mexico. N. D. Newell, J. K. Rigby, A. G. Fischer, A. J. Whiteman, J. E. Hickox, and J. S. Bradley. San Francisco: W. H. Freeman and Co., 1953. Pp. 308. $7.50.

In recent years the spectacular oil developments of Alberta have made geologists reef conscious. However, oilfields in reef limestone areas had long been known in various parts of the world, important among which is the West Texas Permian Basin. Of necessity in oil development the aim is to confine drilling to those areas where oil accumulations are most likely to be found, and hence subsurface data on the reef complexes may be correspondingly restricted. However, a knowledge of the components of a reef complex, and of its formation and evolution, may be of great value in interpreting information obtained from wells, and in directing further exploratory work in those directions in which it is likely to be most successful. The information and views presented in this volume are therefore of special interest to oil geologists.

The authors spent two years in intensive study of the Permian rocks of the Guadalupe Mountains, both in the field and laboratory, the broader aspects of the project having been planned and directed by N. D. Newell. Some of the collaborators spent several weeks studying living reefs and the associated ecological zones in the Bahamas and South Pacific, in order to understand the Permian reefs better.

After a description of the geological setting of the reefs, the book describes the stratigraphy of the general area, the reef complex, and the associated sediments, under the main divisions of the basin, marginal, and shelf deposits. Systematic study of the fossils collected during field work is incomplete, and therefore the account of the palæontology of the reef complex is based on the literature and on such original work as is complete. The final chapters deal with the diagenesis of the rocks and their palæoecology, and very briefly with the question of Permian reef oil. In the latter connexion the view is favoured that the oil was most likely derived from the Delaware Basin. The appendix provides an extensive series of references and check lists of fossil species.

The book is well illustrated by photographs and diagrams. There are discussions of the minor structures in the rocks, of silicification, dolomitization, recrystallization, of the probable depth of the Delaware basin, of the origin of laminations in the basin deposits, and on the movement of fluids, amongst many other topics. Hence geologists with widely varying specialized interests will find something of value in this book, and in some instances they will hope that even greater detail will eventually be published on the information obtained from the extensive studies made by the authors and their associates. G. D. H.

Static Electrification. British Journal of Applied Physics, Supplement No. 2. London: Institute of Physics, 1953. Pp. 104. 25*s*.

A very considerable amount of information on static electrification has been collected, probably for the first time, in this symposium. About a third of the book is given to general principles and to the theory of the production of static charges by various mechanisms. It is obvious from the papers read and the discussion in this section that there is no universally held theory which accounts for all the phenomena observed.

A section is devoted to the use of static electricity for the precipitation of particles and coating purposes and another to the description of electrostatic machines for producing high voltages for use in research and nuclear physics.

In the section dealing with harmful static electrification, the production of static charges in various industrial processes is discussed, and the methods used for avoiding the dangers arising from them are described, together with the underlying theories.

It would appear that in all operations where materials are moving or are making and breaking contact with each other static charges are produced. Whether these charges accumulate or become dangerous depends on the resistances in the system, especially of the material being handled. In general, it would appear that if the resistance of the material is less than 10^9 ohms/cm, static charges are dispersed as fast as they are formed, and no danger therefore arises.

A paper of particular interest to the petroleum industry is that on "The electrification of fluids in motion," which discusses the mechanism of the separation of charges and attempts to calculate the charges to be expected. In equation No. 1, p. S12, for the rate of flow of electricity, the current per gallon of flow will be seen to vary with the Reynolds number and coefficient of resistance, which is contrary to the generally accepted fact that in the region of turbulent flow the charge of current per gallon is independent of velocity. In fact, the curves reproduced in Fig 3 on p. S14, which are used to check the equation, also show that the current generated per gallon is approximately constant and independent of velocity under any given condition. It is difficult to see that this equation can be claimed to give results which agree with those experimentally obtained.

Contained in this symposium are two papers of particular interest to the electrical engineer concerned with power plant and electrical transmission problems. A paper entitled "The physics of electrostatic precipitation" gives, for example, an excellent summary of the theoretical basis on which industrial precipitators operate. A short paper on methods of increasing the electrical conductivity of surfaces by coating with an electrically conducting film, embodies interesting technical information in this field. Of further interest is a short paper illustrating two types of electrostatic field meters, one operating from A.C. mains and the other from dry battery.

In connexion with the application of the information embodied in this symposium to problems encountered in the oil industry, one would note that little has been said of the effects of lightning and induced voltages which play an important part in connexion with the transmission of power in various parts of the world. In the Middle East, for example, the problem of minimizing the effects of lightning on overhead transmission is a most important one in relation to continuity of electricity supply for production purposes. It may be argued that lightning is outside the scope of this particular symposium, bearing in mind that much has been written on the subject in other technical publications; to complete the picture, however, it would have been useful to have included a bibliography of references in order to make the field of the publication as wide and comprehensive as possible.

As a general conclusion from this symposium it can be said that there would appear to be no way of preventing the separation of charges when handling industrial materials, and the methods adopted as safely precautions must be directed toward the prevention of the accumulation of large charges.

This symposium undoubtedly covers very thoroughly theoretical considerations leading to the production of static electricity and the means taken to control it, and as such is of value to anyone requiring expert guidance in this field. E. S. S./F. N. B.

ADDITIONS TO THE LIBRARY

ASTM Symposium on Insulating Oils. Fifth Series. Special Technical Publication No. 152. Philadelphia Pa.; ASTM, 1954. Pp. 45. $1.25.

These proceedings contain the text of a paper on "The Reclamation of Insulating Oils," by Frank C. Doble (Doble Engineering Co) together with an extensive discussion.

Recent developments in power system maintenance have led to the new concept that insulating oils, when properly serviced, can be given practically unlimited extension of life, free from the formation of sludge of excessive acidity due to oxidation even in free-breathing transformers. After a general background discussion of the subject Mr Doble deals with modern maintenance methods, including the tests available and their significance, the various means for reclaiming oil, the effects of inhibition, and the principles upon which an oil maintenance programme is based.

Summary of Water Flood Operations in Illinois Oil Pools During 1952. P. A. Witherspoon. Urbana, Illinois, 1953. Interstate Oil Compact Commission. Pp. 23.

The results of a survey of water flooding projects used to improve oil recoveries in Illinois.

Instrumentation for the Process Industries. Eighth Annual Symposium. Pittsburgh, Pa. The Instruments Publishing Co., 1953. Pp. 36. $2.00.

The Eighth Annual Symposium on Instrumentation for the Process Industries was held by The Agricultural and Mechanical College of Texas in January 1953. Many of the papers and discussions are of interest to members of the petroleum industry. They include: "Sizing Control Valves Handling Flashing Liquids" (G. F. Brockett and C. F. King, Fisher Governor Co); "Use of Field Test Data for Control System Analysis" (P. R. Hoyt and B. D. Stanton, Shell Development Co); "Process Monitoring" (A. F. Sperry, Panelit Inc); "Instrumentation of 'Packaged' Gasoline Plants" (T. D. Tabbert, The Fish Engineering Corpn); "Continuous Control of Plant Stream by Infra-Red Analyser" (D. E. Berger, Phillips Petroleum Co); "The Case of the Graphic Panel" (R. L. Nichols, Magnolia Petroleum Co).

The Rheology of Non-Aqueous Solutions. Road Research Technical Paper No. 28. Road Research Laboratory. Department of Scientific and Industrial Research. London; H.M.S.O. 1954. Pp. 50. 2*s*.

This paper gives the results of investigations undertaken by the Road Research Laboratory to determine the flow properties of mixtures of powdered solids and liquids other than water. Powders used for the work included limestone, granites, elate, silica, etc., and two types of liquid were used for the suspension of the powders: one was a refined coal tar consisting of hydrocarbons of a predominantly aromatic character; and the other a bitumen containing hydrocarbons of a predominantly aliphatic nature which was obtained as a residue in the distillation of crude petroleum.

The first part of the paper describes a systematic study of the flow properties of the powder–liquid suspensions over a wide range of concentration. The results showed the importance of the voids fraction to the dry powders. The second part describes work on the void structure of the packed powders, and the third part relates the results to the rheological behaviour of systems of high solid concentration.

Code for the Storage and Use of Highly Inflammable Liquids. Safety Circular No. 97. Association of British Chemical Manufacturers, 1954. Pp. 16.

IXth International Road Congress, Lisbon 1951: Report of Proceedings. Paris: Editions "Science et Industrie," 1954. Pp. 420.

Construction of Esso Refinery, Fawley. A. P. Gray and Mark Abrams. London: British Institute of Management, 1954. Pp. 39.

Allyl Alcohol. New York: Shell Chemical Corpn, 1950. Pp. 95.

Allyl Chloride and other Allyl Halides. New York: Shell Chemical Corpn, 1950. Pp. 136.

Methyl Ethyl Ketone. 2nd Edition. New York: Shell Chemical Corpn, 1950. Pp. 129.

The Institution of Mechanical Engineers, Automobile Division, Proceedings 1951–52. London: The Institution, 1954. Pp. 227.

British Standards.

B.S. 864: 1953. Capillary and Compression Fittings of Copper and Copper Alloy. Pp. 27. 4*s*. net, post free.

B.S. 2021: 1953. Separating Funnels. Pp. 12. 2*s*. 6*d*. net, post free.

B.S. 2051: 1953. Pt 1. Copper and Copper Alloy Capillary and Compression Tube Fittings for Engineering Purposes. Pp. 20. 3*s*. net, post free.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

685. Contributions of the petroleum geologist. M. J. Davis. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1545.—An appreciation is given of the contributions geologists have made in the past in the study of petroleum geology, together with details of the various fields in which they have become renowned.
E. N. T.

686. Oil discovery trends. P. R. Schultz. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1572.—Reasons are given for the increasing need for statistics and analyses which give an accurate description of the oil industry's past experience as a basis for estimates on the future of oil.

Oil discovery trends are needed in forecasting long term availability, and discovery costs are useful in evaluating the economic feasibility of synthetic fuels. E. N. T.

687. Significant features of graded bedding. P. H. Kuenen. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1044.—In this paper the various types of graded bedding and the associated soft-rock deformations are described and explained.

It is pointed out that some graded beds are produced by volcanic eruptions and others by rivers, and an attempt is made to summarize the status of the problem of graded bedding, and to show how field observations can be particularly useful. E. N. T.

688. Foraminifera, an evaluation. C. C. Church. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1553.—This paper describes the reasons for the growth in the use of microfossils, particularly the foraminifera, in connexion with the oil industry.

The writer believes that there is still a great need of a classification which a majority of palæontologists can use and agree upon. E. N. T.

689. Entrapment of petroleum under hydrodynamic conditions. M. K. Hubbert. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1954.—This is an investigation into the forces which cause petroleum to migrate, and the characteristics of the positions in which it will become entrapped under the general conditions when the environmental ground water is in some state of motion. E. N. T.

690. How to calculate relative permeability of Bradford sand from capillary pressure data. M. E. Hassan and R. F. Nielsen. *Petrol. Engr*, March 1953, **25**, (3), B61.—An equation was derived for calculating permeability from capillary pressure–saturation data for Bradford sand. The analogy between the porous medium and a bundle of capillary tubes constitutes the basis of the method. To correct for the difference between the length of the fluid path and the length of the core the "cementation factor" as empirically defined for Bradford sand was used. The relative permeability curve for the sand was calculated using average values of the $J(Sw)$ function. W. S. R.

691. Shelf principle of oil origin, migration, and accumulation. T. E. Weirich. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 2027.—Regional observations are taken as revealing the principle that oil originated, migrated, and accumulated over a Pennsylvanian shelf in eastern Kansas and eastern Oklahoma.

This area produces oil from both homoclines and anticlines, and commercial production is limited to a shelf, the margin of which moved northwestward during Atokan and Des Moinesian times. Shelf sedimentation in the region was littoral to the continental craton, resulting in a lithologic variation, in contrast to lithologic uniformity of equivalent strata in the adjoining McAlvester basin. E. N. T.

692. Sedimentation rates in Texas estuaries and lagoons. F. P. Shepard. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1919.—A detailed comparison is made between unpublished soundings of Texas bays in the last century and recent surveys.

The depth changes show a reasonable relation to river mouths and to the silt-load measurements of these rivers, when taken in connexion with tide-gauge data, and this suggests coastal sinking.

The fill has occurred primarily as a general shoaling of the flat bay floors and secondarily as a direct encroachment of sub-aerial deltas on to the bays.

The comparison indicates that Texas bays have shoaled an average of 0·82 ft in about 65 years. However, although similar conditions have been continuing for thousands of years, because of renewed sinking or sea-level rising, the bays may persist far longer than the present shoaling rate suggests.
E. N. T.

693. Petrography and petrology of Scurry Reef, Scurry County, Texas. R. E. Bergenback and R. T. Terriere. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1014.—The Scurry Reef of Scurry County in Texas is a subsurface feature some 23 miles long and between 4 and 8 miles wide, which is composed of a low mound, mainly of clastic organic limestone with minor amounts of black bituminous claystone, in general of Permian and Carboniferous age.

It includes 2 oil-bearing areas which form the Diamond-M and Kelly–Snyder oilfields.

It is concluded that this reef was formed from the hard parts of organisms, probably Crinoidea and Foraminifera, which lived, died, and were buried in this area.

A mechanism is suggested to explain the formations of this reef, which is rather different from that of many others.
E. N. T.

694. Upper Ordovician of Central Texas. V. E. Barnes, P. E. Cloud, Jr., and H. Duncan. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1030.—The Burnam limestone was discovered in 1951 in the Llano uplift (southern Burnet County, Texas). These rocks are of Upper Ordovician age, and are considered to be correlative with some parts of the Richmond group.
E. N. T.

695. Distribution of surface turbidity off Mississippi Delta. P. C. Scruton and D. G. Moore. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1067.—The Scripps Institution of Oceanography has carried out important studies of the Recent sediments of the Mississippi River Delta. It is concluded that the amount of material held in suspension, which is controlled chiefly from the volume of river flow and distance from source, while in general decreasing to a small value within a few miles of the shore, may extend to sea for distances of at least 65 miles in the form of long plumes off the mouths of the important passes.

It is concluded that the intensity of surface turbidity can generally be correlated with the rate of deposition.

E. N. T.

696. Tectonic history of Denver Basin. A. W. McCoy III. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1873.—This paper discusses the gross sediments of the Denver Basin from Cambrian through Tertiary, and isopachous maps are presented.

A detailed geological history of the area is given from Cambrian to Recent, which represents a nearly complete cycle of tectonic evolution. E. N. T.

697. Dotsero and Manitou formations. White River Plateau, Colorado, with special references to Clinetop algal limestone member of Dotsero formation. N. W. Bass and S. A. Northrop. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 889.—Recent investigations of the stratigraphy of the White River Plateau have revealed that the age is Late Cambrian and Early Ordovician rather than Late Cambrian only.

This survey divides the sequence into Dotsero and Manitou formations, and the Dotsero dolomite has been redefined as the Dotsero formation, which includes only the lower part (Late Cambrian). The upper part of the former Dotsero dolomite is placed in the Manitou formation (Early Ordovician age).

A detailed survey of the geological formations in this area, and a list of the fossils discovered there, is presented.

E. N. T.

698. Permian and Pennsylvanian rocks of southeastern Colorado. J. C. Maher. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 913.—A detailed geological survey is presented of the rocks in southeastern Colorado. The Pennsylvanian and Permian rocks that underlie most of Kansas extend westward beneath the high plains of southeastern Colorado to the mountain front, where they have been upturned and eroded into foothills.

Maps showing the thickness and distribution of coarse clastics of the Pennsylvanian and Permian rocks suggest that the Apishapa–Sierra Grande uplift, the Wet Mountains, and the Front Range were relatively low land masses at the beginning of Pennsylvanian time.

There are good possibilities of oil production from the porous limestones of Missouri and Des Moines age in Colorado.

E. N. T.

699. Morrow group and Lower Atoka formation of Arkansas. L. G. Henbest. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1935.—A detailed geological survey of the Morrow group and Atoka formations in Arkansas is given. The purpose of this paper is to present the stratigraphy and palæontology of the Morrow group in Washington County, Arkansas.

New divisions have been named, and comprehensive notes (including graphic sections and a map) are given on the location of the more significant exposures of the Morrow group. E. N. T.

700. Regional stratigraphic analysis of Upper Cretaceous rocks of Rocky Mountain region. W. C. Krumbein and F. G. Nagel. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 940.—The purpose of this paper is to present the pattern of thickness and lithologic variation in the Upper Cretaceous and to introduce methods for expressing the vertical variability, as well as the lateral variation in the section.

The isopach-lithofacies maps given indicate a general thickening and increasing sand content in all units from east to west.

Detailed studies of the sand and shale lithology in Arizona, New Mexico, and S.W. Colorado indicate that most of the sands are subgraywackes, decreasing in angular components northeastward, and the shales are mainly silty, the association of lithologic types suggesting unstable shelf conditions over most of the area. E. N. T.

701. Upper Cretaceous rocks of Galisteo–Tonque area, north-central New Mexico. C. E. Stearns. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 961.—This study presents the stratigraphy of the Galisteo–Tonque area and indicates that the Upper Cretaceous rocks of north-central New Mexico comprise 2 broad units—a lower shale (with subordinate sandstone and limestone), commonly called the Mancos shale, and an upper formation of sandstone, shale, and coal, commonly called the Mesaverde.

Upper Cretaceous rocks were gently warped and eroded in pre-Galisteo (pre-Late Eocene) time, and the max indicated dips are about 2°. E. N. T.

702. Pennsylvanian and related sediments of Upper Pecos Valley, New Mexico. R. Sidwell and G. F. Warn. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 975.—A detailed survey of more than 3000 ft of Pennsylvanian sediments accumulated in the northern New Mexico extension of the Colorado zeugogeosyncline is given.

The causes of sedimentation and how it was influenced by several major bordering uplands are shown, and the basins and uplifts are shown on a palæotectonic map. E. N. T.

703. Upper Ordovician and Silurian stratigraphy of Sacramento Mountains, Otero County, New Mexico. L. C. Pray. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1894.—The Upper Ordovician and Silurian strata of the Sacramento Mountains in south-central New Mexico consist largely of dolomite, and can be separated into 4 distinctive lithologic units, namely—2 members of the Montoya limestone and 2 members of the Fusselman limestone. A detailed stratigraphic section representative of these units in the Sacramento Mountains is presented.

A full geologic survey is given for each of the 4 units. Only one unconformity, which is indicated by abrupt lithologic changes, is recognized in the Sacramento Mountains, and this is fully described. E. N. T.

704. Composition of crude oil and its relation to stratigraphy in Wyoming. J. M. Hunt. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1837.—This study was made to determine what geologic factors may have caused the differences in the character of Rocky Mountain crudes, specifically in Wyoming. The conclusions are based on a comparison of the geologic and chemical information regarding the oils.

Correlations are found between the composition of the oils and their environment of deposition as reflected in the nature of their associated sediments, and also a correlation was found between the composition of the Tensleep crude oils and their depths of burial. However, no correlation was found between composition and depth of burial for all Wyoming oil combined, between composition of oils and their age, or possible cat activity of their reservoir rocks.

It was determined that oil from depths greater than 8000 ft in the Tensleep sandstone of Wyoming generally contain more than 50% gasoline, whereas oil from depths less than 3000 ft generally contain less than 25% gasoline.

E. N. T.

705. Carboniferous stratigraphy and structural geology of New Brunswick, Canada. W. C. Gussow. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1713.—The Carboniferous stratigraphy of New Brunswick is described in some detail, and the structure is discussed and illustrated by geological maps and cross-sections.

An attempt is made to record much of the data accumulated

by geological surface mapping and by seismic, gravimeter, and magnetometer surveys, and to interpret them in the light of recent wildcat drilling and other subsurface geological information. E. N. T.

706. Alberta oil sands. D. S. Pasternack. *Petrol. Engr*, Feb. 1953, **25** (2), A58.—Major outcroppings of oil sand covering 1260 sq. miles have been mapped in the region of the Athabaska river.

These sands comprise a portion of the McMurray formation (L. Cretaceous) resting unconformably on the Waterways Limestones (U. Devonian). Large-scale cross bedding in the McMurray has been interpreted as the foreset beds of a delta.

Two theories for the origin of the oil have been expounded. One suggests a near source origin, the oil having undergone little or no change. The other suggests an "escape oil" from the Devonian during and after the deposition of the L. Cretaceous formations.

Various attempts have been made to extract the oil. These include: (1) solvent extraction; (2) hot water washing; (3) cold water washing; and (4) retorting, all with some degree of success. W. S. R.

707. Reefal oil reservoirs in Western Canada. R. Pot. *Petrol. Engr*, Feb. 1953, **25** (2), B61.—All oil-containing reefs found so far in W. Canada can be traced to Devonian times. Greatest crude reserves (1·5 billion brl) have been found in the D3 (Leduc) formations of Upper Devonian, consisting of reef limestone (biohermal) and dolomites capped by green shales. Overlying this there is the D2 (Nisku), consisting of bedded biostromal limestones and dolomites. These are estimated to contain about 140 million brl.

Porosity of the D3 varies considerably, there being primary and secondary porosity, together with intercrystalline and intergranular porosity, whilst cracks and fissures also assist. There is good continuity, giving permeabilities averaging 300 md. In the D2, porous layers alternate with dense carbonates and silts.

Well spacing is limited to 40 acres, the recovery mechanism being bottom water drive in most D3 reservoirs, though several have large gas caps. Due to stratification in the D2, fluid movement is reduced, though in some cases water drive is present. Where the D2 dips steeply edge water effects are observed. W. S. R.

708. Is there any oil on the fifth continent? E. G. Nottes. *Petrol. Engr*, Apr. 1953, **25** (4), A48.—The main continent of Australia has to date no commercially producing oilfields, although the island of New Guinea already yields 4000 b.d.

Recently exploratory wells have been drilled in 8 of Australia's 14 sedimentary basins. 2 basins (Roma and Lakes Entrance) had good showings of oil, but active drilling has been disappointing.

Drilling in New Guinea, Australia, and New Zealand is described, together with favourable geological areas. W. S. R.

709. The Cyrena marls of the Oligocene of Alsace. S. Gillet. *Rev. Inst. franç. Pétrole*, Aug. 1953, **8** (8), 393–422.—Wells at Eutzheim, nr Strasbourg, Ebersheim, nr Selestat, and Pulversheim, nr Mulhouse, have yielded samples which form the basis of the study. The lithology of the rocks found in the 3 wells is briefly noted, while the various fossil forms are described in considerable detail, and in some cases drawings and photographs are given. The fauna includes foraminifera, bryozoa, lamellibranchs, gastropods, ostracods, echinoids, and fish. There are marine, brackish, and fresh forms. The Upper Stampian sea differed in salinity from that of the Lower Stampian, being more fresh. The Cyrena sea of the Upper Stampian was connected with N. Europe by a sea covering part of Germany, but it also communicated with the Alpine sea by a basin in which the Swiss molasse was deposited. At this date it had become a narrow channel. The forms found in the Cyrena marls described were littoral or coastal, and show that the sea was less deep than in the Lower Stampian. The temp were lower than in the Eocene. Species rare in the Lower Stampian are abundant in the Upper Stampian. These are brackish forms: Potamides, Corbiculides, and Cyrenides. G. D. H.

710. Oil exploration in Northern Bosnia. I. Soklic. *Nafta (Yugoslavia)*, Nov. 1953, **4**, 345–51. The existence of oil seepages in Northern Bosnia was recorded as far back as 1898. This has given rise to deep exploratory drillings before the first world war at Zavid, Dolovi, Pozarnica, and Rozanj. The oil carriers in this area are located in the Eocene or Oligocene, and are highly disturbed, thus being without significance for the commercial production of oil. From 8 positive wells about 800 tons of oil were obtained in the course of 2 years. In 1951 the exploration of Miocene strata of the anticline Ravna Tresnja at Tuzla was undertaken. Drilling of the first well met with edge water. At present the higher parts of the structure are being explored. The latest geological and geophysical explorations are directed towards the area near the River Save (Bosanska Posavina), as there are prospects for finding oil in strata of the Upper Miocene and Pliocene, which are linked to the neighbouring oilfields in Croatia and Slavonia. (Author's abstract.)

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

711. New aerial shooting technique faster. Anon. *Petrol. Engr*, Feb. 1953, **25** (2), B85.—Method employs a mortar to project a bomb to any predetermined height between 50 and 600 ft.

Advantages of the method are that survey costs are reduced due to elimination of drilling equipment, shooting truck, and water truck.

The method neutralizes much of the detrimental effect of ground roll and other interference. Between the two extremes (50 and 600 ft) the optimum reflection interference ratio may be obtained. W. S. R.

712. Electro-magnetometer for exploration. W. Rintoul. *Petrol. Engr*, March 1953, **25** (3), B59.—Component parts for the airborne magnetometer, which weighs 207 lb, are the recorder, computing device, and magnetic detector. The recorder is mounted in the cockpit, the computer between the pilot and operator, and the detector is attached rigidly to the longerons forward of the tail rotor.

Measurement of the magnetic field is recorded on a strip chart, it being possible to draw contours on the basement rock from the recorded readings. These contours will suggest any earth movement subsequent to oil occurrence, and indicated anticlines and synclines enable the geologist to determine inferentially the location of possible oil-bearing strata.

Ability of a helicopter to land anywhere, especially in otherwise inaccessible places, makes it ideal for airborne magnetometer surveys. Up to 1000 sq. miles/month have been surveyed by this method. W. S. R.

713. Electrochemical methods for the measurement of soil aggressivity. T. Markovic. *Nafta (Yugoslavia)*, Sept. 1953, **4**, 299–303.—2 methods for measuring rates of corrosion of metals in soils by means of platinum as an auxiliary electrode and the element Fe (rough surface)/wet soil/Fe (smooth surface), are discussed. Measurements with Pt as an auxiliary electrode show that 2 types of corrosion of Fe in sands, clays, and clayey soils can be differentiated: an active one, when the soil is below the saturation limit, and a passive one, when the soil is completely covered with a water layer. By means of the element F (rough)/wet soil/Fe (smooth), the effect of electrolytes on the increase of the corrosion intensity, was investigated using the time necessary for the compensation of the electrode potential as a measure of soil corrosivity. (Author's abstract.)

714. Patents. U.S.P. 2,643,367 (5.1.48; 23.6.53). Phillips Petroleum Co. Magnetostriction seismometer.

U.S.P. 2,641,749 (15.12.51; 9.6.53). Standard Oil Development Co. Improved means for recording the instant an explosion takes place during the shooting step in seismic prospecting, comprising a firing circuit *A* for the explosive charge *C*, a signal source *B*, means for adding a pulse of selected polarity to *B* on closing *A*, and a pulse of opposite polarity to *B* on opening of *A* when *C* detonates.

U.S.P. 2,642,479 (5.1.48; 16.6.53). Sun Oil Co. Device for detecting or measuring magnetic fields.

U.S.P. 2,642,477 (Finland 8.9.47; 16.6.53). M. Puranen and A. A. Kahma. Method for inductive prospecting.

V. P. P.

DRILLING

715. Exploratory drilling in 1952. F. H. Lahee *et al.* *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1193.—The paper by the Chairman of the American Association of Petroleum Geologists is the 8th annual report on data gathered by the committee on statistics of exploratory drilling, and summarizes the data given in a number of following papers.

During 1952, 12,425 exploratory holes were drilled in the U.S.A. Of these 6689 were new field wildcats, 3298 were new pool tests (including new pool wildcats, deeper pool tests, and shallower pool tests), and 2429 were outposts. Among the new field wildcats, 741 were successful; among the new pool tests, 888 were successful, and among the outposts, 706 were successful.

The total exploratory footage drilled in the U.S.A. in 1952 was 55,615,389 ft in the 12,425 holes, or 4476 ft per hole. These figures compare with an average depth of 4197 ft per hole in 1951.

In 27 other papers a number of authors describe in detail the drilling progress that was made in every one of the United States and Alaska where oil operations were taking place during the year in question. Statistics are given of the footage drilled, the number of successful wildcats, and the most important additions and extensions to the previously known oilfields.

Figures are given in each case showing the production of the oil and natural gas hydrocarbons during 1952 as compared with the previous year.

This symposium provides a very valuable record of U.S. oil operations statistics during 1952. E. N. T.

716. New products from drilling mud. M. J. Dupic. *Rev. Inst franç. Pétrole*, 1953, **8**, 51–69.—Researches are reported, using American technique, in which the muds resemble American muds in characteristics. Satisfactory operation includes drilling through terrain with high electrolyte cont, realization of large open holes (uncased—economy in casing), increase of max depth, avoidance of drilling difficulties caused by subsidence of the terrain, limited invasion of production zones. The tech and financial results of experiments to reduce increasing costs when using bentonite, barytes, organic colloids (starch–C.M.C.), visc reducers (phosphates, tannates), are discussed. Fucus and potato starch (organic colloids) and humic acid as a fluidizer show considerable economies. R. T.

717. Treating clay mud with starch, alkali, and phenol. M. Simonovic. *Nafta* (*Yugoslavia*), 1953, **4** (10), 324–30.—Properties of a drilling mud are described, which was obtained by treating the clay mined at Rudovci with an addition agent prepared from cooked starch, caustic soda, and phenol. The procedures for preparing the addition agent and the mud are described. A satisfactory heavy drilling fluid was also obtained by adding baryte to the mud prepared in the described way. (Author's abstract.)

718. Application of radiation logs in oilfields. P. Charrin and J. H. Russell. *Petrol. Engr*, Apr. 1953, **25** (4), B59.—The article limits itself to a description of the simultaneous logging of natural γ-rays, the neutron–neutron log, and the collar log. Instrument is 9 ft long with a 3½-inch O.D., and is suspended on an armoured steel cable, power being supplied down the insulated core of the cable. A two pen recorder automatically charts the results on well log paper moving synchronously with the sub-surface instrument.

Applications of the logs are numerous, and can be applied to both old and new wells. They can be used in work-over programmes to find new pay formations previously ignored (casing in the hole has no effect on the logs), whilst in new wells they help control depth of completion (collar log) and determine gas–oil contracts. Porosity can be determined easily by this method, as the neutron log is primarily influenced by hydrogen ions and therefore by the presence of fluid. Recently quantitative results have been derived for porosity from these logs.

Article includes many diagrams and logs. W. S. R.

719. Origin of the electric potential observed in wells. W. M. McCardell, W. O. Winsauer, and M. Williams. *J. Petrol. Tech.*, Feb. 1953, **5** (1), *AIMME Tech. Paper No.* 3500, 41–50.—The electrical potential difference between 2 saline soln separated by shale is shown to be a consequence of the electrical double layer of the shale surfaces. Mathematically it is shown that the potential depends on the shale characteristics and on the concn of the soln, and this relationship was confirmed by experiments using a long shale core. The relationship also fits the variation of potential with change in clay content of sand–clay mixtures. Adsorption of negative ions on the clay particles leads to the phase boundary potentials, and these account for the major part of the potentials observed in a well. There may also be diffusion potentials. Differences in clay character or in compaction may cause potentials.

Previously proposed methods for estimating water salinities from the potential logs may yield low values in some cases. G. D. H.

720. Drilling of Gensac 6. A. Maurice, S. Maurice, and T. A-L-René. *Rev. Inst. franç. Pétrole*, 1953, **8**, 35–46.—The paper describes drilling operations with R.A.P. heavy equipment on Gensac 6 well. Satisfactory boring to a total depth of 5843 m, with one casing only to a depth of 301 m, leaving 3541 m "uncased," is reported. Comparative tests made with numerous types of mud are described and results tabulated. It is shown that fucus, potato starch, etc., control the pH and visc of the mud efficiently without fermentation. By inserting 2 packers (straddle mounted) a production test of a zone situated *ca* 50 m from the bottom is obtained. R. T.

721. Drilling camp in A.E.F. P. Litchfouse. *Bull. Ass. franç. Tech. Pétrol*, May 1953, **31**, 9–24.—The problems and the equipment and layout, of drilling camps in French Equatorial Africa are discussed. Pumps, derricks, mud tanks, pipe racks, cement shed, dog house, power units, electrical distribution equipment, transport, and housing are all described in detail in some cases. Much of the equipment is skid-mounted. Reference is also made to the matter of personnel. G. D. H.

722. Patents. U.S.P. 2,640,544 (27.12.49; 2.6.53). Baker Oil Tools Inc. Casing centralizer embodying outwardly bowed springs which are subjected to a minimum bending moment and minimum deformation under extreme loading conditions.

U.S.P. 2,640,545 (31.1.52; 2.6.53). B. Share. Well point construction imparting a turbulent or swirling action to the jetted water.

U.S.P. 2,642,942 (15.8.50; 23.6.53). C. B. Reynolds. Drilling equipment and well pipe cleaner.

U.S.P. 2,642,941 (19.7.48; 23.6.53). L. B. Collins. Combined cable wiper and splash shield.

U.S.P. 2,643,005 (12.3.48; 23.6.53). F. D. De Jarnett and P. A. Medearis. Well pipe handling equipment.

U.S.P. 2,643,006 (28.9.49; 23.6.53). W. R. King. Automatic pipe handler.

U.S.P. 2,643,007 (20.7.51; 23.6.53). B. W. Gray. Pipe handling apparatus.

U.S.P. 2,643,094 (5.12.49; 23.6.53). Reed Roller Bit Co. Method of drilling earth bore holes in which a fluid *A* of sp. gr. > sp. gr. of formation is deposited in the hole and a drilling fluid *B* of sp. gr. < sp. gr. of *A* is jetted upwardly just above level of *A* to accelerate removal of cuttings therefrom, and a small portion of *B* is discharged into *A* to cool it.

U.S.P. 2,643,095 (16.5.51; 23.6.53). A. Arutunoff. Apparatus for drilling deep wells.

U.S.P. 2,640,271 and 2,640,275 ((*a*) 27.4.48 (*b*) 29.4.49; 2.6.53). Standard Oil Development Co. Apparatus for determining the orientation, dip, and strike of strata traversed by a borehole.

U.S.P. 2,640,269 (30.12.49; 2.6.53). Phillips Petroleum Co. Device for measuring the level of a liq such as drilling mud and other thixotropic fluids.

U.S.P. 2,641,488 (12.11.47; 9.6.53). United States Steel Co. Bending fatigue strength of rotary steel drill pipes is increased by employing in the threaded regions threads preferably of the V-type having roots rounded and cold worked, the sides and crests of the threads not being cold worked.

U.S.P. 2,641,447 (9.1.50; 9.6.53). A. W. Kammerer. Rotary drill bit embodying a toothed gauge or reaming (expansible toothed) roller cutter that can form a shoulder in the formation of such shape as to co-operate with the cutter and hold it in an outward position during drilling. The form of the shoulder minimizes the tendency of the shoulder to break off under the drilling weight imposed and prevents the formation from squeezing the cutters inwardly.

U.S.P. 2,641,446 (Sweden 28.2.48; 9.6.53). Sandvikens Jernverks Akt. Bore crown for percussion drilling provided with 2 separate cutting elements of hard metal which need be ground only along one surface at each cutting edge.

U.S.P. 2,641,445 (7.11.49; 9.6.53). Snyder Oil Tool Corpn. Rotary impact drill having a fluid coupling between the drill stem and the bit operable to rotate the bit at a speed equal to or different from that of the drill stem. This rotational difference is used to operate an impact means by converting a portion of the energy into reciprocating movement of a hammer, the remainder of the energy being used to rotate the bit.

U.S.P. 2,641,444 (3.9.46; 9.6.53). Signal Oil and Gas Co. Method and apparatus for drilling boreholes.

U.S.P. 2,641,322 (4.6.49; 9.6.53). A. C. Hartsell. A tool for insertion into pipe being pulled from a well which will remain at a selected level in the pipe and prevent liq escaping above it. A safety device is provided so that the tool will automatically anchor itself in the pipe if the liq in the pipe develops a high pressure.

U.S.P. 2,642,267 (17.1.51; 16.6.53). J. A. Zublin. Apparatus for initiating and drilling curved bores from existing vertical well bores.

U.S.P. 2,642,268 (28.2.48; 16.6.53). A. L. Armentrout. Method of recovering lost circulation in drilling wells.

U.S.P. 2,641,927 (1.2.51; 16.6.53). D. B. Grable and W. A. Vock. Apparatus to be lowered into a well pipe comprising a vibrator which produces successive impacts against the pipe and a device for receiving and transmitting energy created by the impacts. V. P. P.

PRODUCTION

723. Rock scaling releases trapped oil. F. R. Cozzens. *Petrol. Engr*, Apr. 1953, **25** (4), B11.—Composite elements of reservoir structure that undergo disruption during the completion and maintenance of an oil well are indirectly responsible for a great many plugging problems affecting production. The more soluble fractions of these elements are conveyed to a well by incoming fluids, and readily consolidated at the well face. Resultant changes in face composition can gradually build up a pressure differential and vary temperatures, thus forming a base on which waxes, salts, and other sedimentary deposits are built up. Oil thus becomes trapped behind the formation face, and can be released only by scaling off or eradicating the affected lens of rock.

This scaling is now being accomplished by: (1) heating units; (2) nitroglycerine, and (3) reactive chemicals.

Practical applications of these agents are described in the article. W. S. R.

724. Producing cracks in productive strata. M. Mejak. *Nafta* (*Yugoslavia*), 1953, **12** (4), 386–8.—2 contemporary methods are described for producing new, and enlarging existing cracks in productive strata, which are applied in the production of oil and gas from production wells. One of these methods is related to the application of acid gels, which are driven under pressure into the productive strata, thus effecting fracturing of the strata by way of chemical and mechanical action. The other method consists of the application of explosives. It is suggested that both methods, combined with the well acidizing of productive wells with hydrochloric acid, should be applied in Yugoslavia in order to increase the output rate of domestic wells. (Author's abstract.)

725. The detection of ions in oilfield waters. M. Cubelic. *Nafta* (*Yugoslavia*), 1953, **12** (4), 389–90.—The article presents simple tests for ions in oilfield waters, *i.e.* iodide, bromide, sulphide, nitrate, silicate, iron, aluminium, and boron. (Author's abstract.)

726. Oil production in the territory of Yugoslavia before the first world war. 2. B. Horvat. *Nafta* (*Yugoslavia*), 1953, **4** (8), 250–60.—The fourth phase of the industry's development is described. This phase, beginning in 1907 and ending with the end of the first world war and with the creation of the new Yugoslav state, is characterized as a period of stagnation. There was no more drilling in Bosnia, and only at one place in Croatia (Veliki Poganec); exploration ceased in Medumurje too. The only attempt to begin anew with drilling operations was made in Medumurje between 1911 and 1914 on Singer's claims, by an English–Hungarian oil syndicate, but with very little success. However, during the war, for war needs, the search for oil began anew, and in 1918 the first gas field in the country, Bujavica near Lipik, was opened. (Author's abstract.)

727. Patents. U.S.P. 2,641,924 (11.9.47; 16.6.53). Socony-Vacuum Oil Co. Mercury is introduced into an evacuated chamber containing a core sample so as to envelop it, and the Hg is then subjected to a series of incremental increases in pressure, after each of which the decrease in vol of the Hg is measured. The relative amount of pores of various size ranges may thus be determined.

U.S.P. 2,640,213 (8.9.48; 2.6.53). Pittsburg Pipe Cleaner Co. Hydraulic propelling unit for pipe cleaners which readily adapts itself to different pipe cross-sections while retaining sufficient of the propelling liq to operate it.

U.S.P. 2,640,542 (11.9.47; 2.6.53). L. E. Brown and W. Ollin. Sidewall sample-taking device which may be maintained in inactive position while being lowered into the well bore and equipped with releasing means effective, when released, to allow the pressure of the well to cause an expansible packer to expand into contact with the walls of the bore, thereby sealing off an area of the walls, and to place the sample chamber into communication with the walls to allow the fluid from the sealed off area to flow into the sample chamber.

U.S.P. 2,640,543 (18.8.47; 2.6.53). Baker Oil Tools Inc. Hydraulically operable valve controlled well tool for use in making water shut-off tests, production tests, etc., as well as squeeze cementing, acidizing, etc., following or prior to such tests, without withdrawing the tool from the well bore. The valve may be operated hydraulically by manipulation of the running-in string attached to the well tool.

U.S.P. 2,640,546 (11.3.49; 2.6.53). Baker Oil Tools Inc. Well packer apparatus embodying a setting tool which can be released and withdrawn completely following setting of the well packer in the casing.

U.S.P. 2,640,548 (22.5.50; 2.6.53). Baker Oil Tools Inc. Dump bailer having a simple latch or lock device for holding the bailer closed, which device is easily released to open the bailer for deposit of its contents in the well bore. Provision is also made to minimize danger of fouling the bailer or premature dumping of its contents.

U.S.P. 2,640,547 (12.1.48; 2.6.53). Baker Oil Tools Inc. Subsurface setting or operating tools for well apparatus which utilize slow burning materials to develop a gradually increasing force for operating or setting the well apparatus. A suitable fuel consists of 75% $KClO_4$ with 25% asphalt.

U.S.P. 2,641,197 (19.5.49; 9.6.53). S. L. Stone. Subsurface reciprocating pump with an arrangement of valves which eliminates gas locks and a structure which permits complete removal from the well tubing under all conditions, even when the lower end of the plunger tube is surrounded by sand.

U.S.P. 2,642,943 (20.5.49; 23.6.53). Sinclair Oil and Gas Co. Method of recovering gas and oil from formations penetrated by ≮1 input well *I* and ≮1 output well *O* which comprises establishing a zone of high temp *H* at 700°–2500° F in the formation, surrounding *I* by hot gas flow, moving *H* as a wave front by cold gas flow outwardly and horizontally from *I*, revivifying *H* by introducing *ca* 1·33–6·0% oxygen into the formation to establish a combustion wave front *C*, and controlling relative rates of movement of *H* and *C* to obtain approximate coincidence by regulating the mass velocity of free oxygen introduced.

U.S.P. 2,642,811–12 ((*a*) 9.7.48 (*b*) 13.6.49; 23.6.53). Merla Tool Corpn. Well flow apparatus.

U.S.P. 2,642,139 (26.4.46; 16.6.53). Stanolind Oil and Gas Co. Apparatus for dispensing a treating agent in a well.

U.S.P. 2,642,141 (31.8.51; 16.6.53). Shell Development Co. Collapsible packer for well instruments.

U.S.P. 2,642,142 (20.4.49; 16.6.53). Stanolind Oil and Gas Co. Hydraulic completion of wells.

U.S.P. 2,642,507 (16.10.51; 16.6.53). J. M. West. Control mechanism for well pumps.

U.S.P. 2,641,922 (16.10.44; 16.6.53). A. L. Smith. Device for indicating the release of gas from a core sample.

U.S.P. 2,641,923 (18.6.51; 16.6.53). S. W. Binckley. Gas gravitometer.

U.S.P. 2,641,934 (14.10.49; 16.6.53). R. A. Werts. Automatic liq sampler. V. P. P.

OILFIELD DEVELOPMENT

728. Mississippi's Black Warrior basin yields gas condensate. Pt 1. F. F. Mellen. *World Oil*, June 1953, **136** (7), 77.—Present activity in the Black Warrior basin has set up many records—the old Amory field has been converted into the first gas storage reservoir in Mississippi.

The geology of the basin is structurally and stratigraphically complex. Lying between the Appalachian and Ouachita orogenies, it is a unique triangular basin. The basin is genetically associated with the McAlester–Arkansas Valley basin, the Cumberland Plateau geo-syncline, and numerous other structural belts in neighbouring states.

Drilling to date is insufficient to show the relationship of the productive reservoirs to structural features. Wells in the Aberdeen and Muldon fields both produce from the same sand (Sanders), but at sub-surface depths over 1800 ft apart.

Much geophysical work is being carried out.

The article includes diagrams and maps. W. S. R.

729. Developments in Eastern Canada in 1952. W. A. Roliff. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1485.—This report covers the development and exploratory activities in the 6 sedimentary basins of Eastern Canada during 1952.

During this period 88 exploratory wells were drilled, compared with 56 wells in 1951. The increase was due entirely to more active exploration for shallow Devonian oil in Southwest Ontario. 2 Devonian oil, one Devonian gas, and 4 Silurian gas pools were discovered, all in that area.

Development drilling was continued at the same rate as in 1951, and 268 wells were completed, 25 oil, 160 gas, and 83 dry holes. Oil production in 1952 amounted to 205,594 brl, and gas production was 8,183,042 m.c.f. E. N. T.

730. Developments in Western Canada in 1952. J. O. Galloway. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1495.—Exploration and development activities in western Canada in 1952 were greater than in any previous year, and new records were established. Alberta led in activity, and Saskatchewan was second. 174 geophysical parties were operating at mid-year, but the number was reduced to 168 parties at the year's end.

Drilling activity was also high, with 253 drilling rigs operating at mid-year, but only 226 rigs at the year's end. 879 exploratory tests were drilled, of which 27% were successful. 146 new fields were discovered, of which 77 were oilfields. 1277 development wells were drilled, an increase of 492 over the previous year. Of these, 89·5% were successful.

Production during 1952 was 61·6 million brl, an increase of 13·7 million brl over 1951. Production averaged 167,000 b.d. Crude-oil reserves increased from 1376 million to 1745 million brl. Natural gas reserves were also increased, but export, except on a limited scale, was not permitted.

E. N. T.

731. Operations in the Leduc field today. J. Menner. *Petrol. Engr*, Feb. 1953, **25**, (2), B47.—Main production comes from 2 separate limestone reservoirs, the D2 and D3, with a small amount from higher localized sandstone traps. The limits of the D3 pool have been determined, but those of the D2 are still unknown.

Already 1000 wells have been drilled, completion being at 5300 ft in the D3 and 5000 ft in the D2. Very high drilling rates are recorded to 4000 ft, but below this the rate decreases. Anhydrite occurs at 4600 ft and necessitates the use of a gypsum base mud.

Numerous sections, diagrams, and photographs are included. W. S. R.

732. Developments in Mexico in 1952. E. J. Guzmán and F. Mina U. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1506.—The 307 wells drilled in Mexico in 1952 represent an increase of 14.6% over the 268 wells drilled in 1951.

Discoveries made during 1952 include 5 new oil or gas fields, 23 new pools, and 16 extensions. The reflection seismograph and subsurface geology were the most successful methods of exploration. Surface geology and geophysical exploration increased from 387 party-months in 1951 to a new high total of 421 party-months in 1952.

Crude oil and dist production for 1952 was 77,277,901 brl. The small decrease of 30,349 brl from the total 1951 production is not related to developmental factors. Total gas production was 93,539,634,664 cu. ft.

The year marked a new modern high for petroleum exploitation and exploration in Mexico. Although activity was largely concentrated in the known petroliferous provinces, the exploration programme in the unproductive Veracruz Embayment was carried on at an unprecedented rate in both geological and geophysical investigation. E. N. T.

733. Petroleum developments in South America and Caribbean area in 1952. J. F. Mason. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1586.—A statistical survey of oil production during 1952 in South America is presented.

An increase in production was made in Venezuela, Colombia, Argentina, and Chile. Further exploration is taking place in Peru. E. N. T.

734. Chile. Anon. *Petrol. Engr*, March 1953, **25** (3), A49.—Activities have been carried out in Magallanes over about 5400 sq. miles. Seismic tests have been made over 772 sq. miles, whilst 2702 sq. miles have been surveyed gravimetrically.

Of some 83 wells drilled up to Dec. 1952 42 produced oil, 21 gas, and 20 were dry. Production for 1952 was 909,758 brl.

Further exploratory work is being carried out, and some 30 wells are expected to be completed during 1953.

W. S. R.

735. Petroleum developments in Middle East and adjacent countries in 1952. W. E. Heater. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1685.—Petroleum production in the Persian Gulf countries in 1952 reached a record figure of 762,400,900 brl, and production in India, Pakistan, and Burma totalled 4,560,000 brl.

New fields were discovered in Kuwait, and additional drilling in Saudi Arabia has shown that the Ain Dar and 'Uthmaniya areas, together with the Shedgum area, are part of the same field.

An additional outlet has been provided by the 30–32-inch line from the Kirkuk field to Banias. E. N. T.

736. Petroleum developments in Africa in 1952. H. D. Hedberg. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1648.—Great increases in petroleum production have been made in Africa during 1952 (particularly in Algeria and French Morocco), a record figure of 17,535,401 brl being reached.

Maps are given to show geological and geophysical exploratory activity, as well as new concessions granted.

E. N. T.

737. Petroleum developments in Far East in 1952. G. F. Barnwell. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1700.—Statistical data are given on production and exploration activities in the Far East, and the sedimentary basins and oil producing areas are presented in regional maps.

Production of petroleum in the Far East countries totalled 104,815,162 brl during 1952.

A pipeline outlet in Central Sumatra was completed in 1952, bringing into production the Minas field, which is now the largest oil pool in the Far East. E. N. T.

738. Japan. L. W. Stach. *Petrol. Engr*, March 1953, **25** (3), A55.—Production—2,133,569 brl—during 1952 was lower than in the previous year, due to conservation measures after excessive production at high G.O.R. in the Yabase field. Secondary recovery by water flooding was introduced in the shallower reservoirs of Yabase, and production increased by some 2·3%.

Exploration successes include a wildcat in the Shinjo basin producing 100 b.d., whilst deeper tests at Yabase also proved the existence of greater thicknesses of pay sand. W. S. R.

739. Petroleum developments in Europe in 1952. F. E. Von Estorff. *Bull. Amer. Ass. Petrol. Geol.*, 1953, **37**, 1620.—This paper gives statistics of oil production in all countries of Western Europe during 1952, and details new explorations made and new fields found.

7 new oilfields were discovered in Germany, and 2 gas fields in Italy.

Petroleum production increased by 20·6% from 1951, due mainly to development of fields in Germany. E. N. T.

TRANSPORT AND STORAGE

740. First 31,000 ton motor tanker. Anon. *Mot. Ship*, Dec. 1953, **34** (405), 366.—Machinery arrangement plans, together with a general description of the ship and its propelling machinery, are given for the *Octavian*. This is a twin-screw 14½-knot vessel of almost wholly welded construction which was launched in November by Swan, Hunter, and Wigham Richardson for Hilmar Reksten of Bergen, and is the first of r ay motor tankers of 31,000 tons now on order. U. M.

741. Tank capacity chart. Anon. *Fuel Oil & Oil Heat*, Oct. 1953, **12** (10), 79.—A chart is reproduced which can be used for the determination of the quantities of oil in round storage tanks. Directions for its use are included. The chart can be used for any liq. D. K.

742. New vent valve cuts vapour losses. Anon. *Petrol. Process.*, 1954, **9** (1), 62–5.—A new valve known as the Rotating Vacuum and Press Relief Valve has successfully been used on a stabilized gasoline storage tank. The valve is completely sealed in an ethylene glycol–water soln, and can operate at temp as low as −40° F without danger of freezing. The valve unit, consisting of vac and pressure actuators, and a pivot-mounted rotor, operates intermittently, opening to full cap in a few seconds. When tank pressure reaches a set value, the valve closes completely until the tank pressure rebuilds to the set value.

In one test with this new vent valve, losses from an 80,000-brl tank containing stabilized gasoline were only a tenth of the losses from a similar tank containing the same product but equipped with conventional tank venting devices.

J. W. H.

743. New foam cuts evaporation losses. E. G. Ellerbrake and F. Veatch. *Oil Gas J.*, 16.11.53, **52** (28), 223.—Economics of the new inert foam "microballoons" in installation and use in preventing crude-oil evaporation losses are given.

G. A. C.

744. Flexible protective casings for pipelines. E. A. Slade. *Oil Gas J.*, 16.11.53, **52** (28), 215.—The use is discussed of the electronic calculator for the solution of problems in design of pipe casings by the Spangler method. These calculators can also be used to determine the operating capacity of a line under a wide range of operation cost factors, and to calculate oil-run tickets and crude oil payments. 6 figures illustrate the article. G. A. C.

745. When pipelines take a water route. P. H. Timothy. *Oil Gas J.*, 18.1.54, **42** (37), 105.—Max protection of the Southern Natural Gas Co's supply lines in South Louisiana where the lines pass through heavily wooded swamps, marshes, lakes, and open gulf is obtained by applying concrete coatings to the pipe. The coatings were wrapped and proper weighting of marine lines achieved. G. A. C.

746. Field tests of exterior coatings for a pipeline conveying fuel oil heated to 200° F. E. R. Stauffacher and R. R. Davidson. *Corrosion*, 1953, **9** (10), 377–81.—20-ft lengths of coated 8-inch pipe were buried, and oil at 200° F was circulated through them. Deformation of the coatings under various loads was measured. Lengths of coated pipe were also bent while cold, and examined for cracks. A ½-inch thick asphalt mastic coating is recommended on the basis of these tests. K. G. B.

747. Technical description and operation characteristics of the Le Havre–Paris pipeline. M. J. Capdeville. *Rev. Inst. franç. Pétrole*, 1953, **8**, 35–46.—The Le Havre–Paris pipeline constructed with 10-inch API weldable steel and recovered pipes is discussed with the aid of maps and photographs. Normal delivery of crude and refined products to the 12 Paris terminals is 1 million tons p.a., by boosting 1·5 million, by erecting a pumping station at Pontoise 2 millions. To diminish the no. of stations pumping is carried out at 70 kg/cm², giving a factor of safety *ca* 3. At this pressure pumping even from Port-Jérôme to Paris is possible. 4 pumping stations—each with a standard heat-insulated 5000 l-reservoir—are equipped with 3- or 4-stage centrifugal pumps with an output of 200 m³ at *ca* 25 kg/cm² pressure.

The pumps are activated by asynchronous electric motors of 300 h.p., under a voltage of 3000 V, whose speed is 2950 rev/min. Switching and starting is automatic. Special coatings and cathodic protection are used, ensuring protection above 10,000 ohms/cm². Between Le Havre and Pontoise 5 commutator stations suffice to draw off the pipeline current. Mechanical, hydraulic, and general safety measures are discussed. Relevant details on quantity and quality control, storage, distribution, etc., are presented. R. T.

748. Patents. U.S.P. 2,642,957 (27.8.48; 23.6.53). Wattpar Corpn. Gasoline fuelling and servicing system for aeroplanes.

U.S.P. 2,643,023 (19.5.51; 23.6.53). Chicago Bridge and Iron Co. Hose drain for floating-roof tanks. V. P. P.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

749. In maintenance it's organization and planning that get results. C. E. Gunter. *Oil Gas J.*, 18.1.54, **52** (37), 99.—A detailed study is presented of the maintenance procedure at Gulf Corpn's Port Arthur, refinery. The plant consists of nearly 40 separate departments, with more than 350 operations. G. A. C.

750. Separation of emulsions in a cyclone. J. J. van Rossum. *Ingenieur, 's Grav.*, 2.10.53, **65** (40), 89–93.—The hydrocyclone has already found several applications as a solid–liq separator, but little information is available about its suitability for the separation of 2 liq phases. The paper deals with some experiments on water in oil emulsions in a cyclone of conventional design. As a criterion for the separating efficiency, the separation number E_s is proposed, and its physical meaning discussed. The influence of volume split and visc of the continuous phase on efficiency and pressure loss is investigated and the experimental results compared with the ideal calculated values. Drop sizes were obtained from photomicrographs. G. F. T. C.

751. Control methods in boiler feed-water treatment—3. E. W. Ellis and H. E. Carlson. *Oil Gas J.*, 30.11.53, **52** (30), 105.—Method of sampling softener effluents is given, and control limits and frequency of tests listed.

Analytical methods are discussed for estimation of total hardness phosphate ion and total dissolved solids in boiler feed water. G. A. C.

752. Graph aid in specifying insulation. Anon. *Petrol. Process.*, 1954, **9** (1), 99–100.—A heat loss graph is presented to help the engineer in determining the most economical thickness of mineral wool blanket insulation without requiring reference tables or repeated calculations. Details are also given of cost comparisons for various thicknesses of insulation. J. W. H.

753. Controlled volume pumps. J. Procopi. *Petrol. Process.*, 1954, **9** (1), 75–8.—This article deals with the use of controlled volume pumps in various fields of petroleum processing, *e.g.* fuel oil treating, crude de-salting, and sampling. A general outline of how pumps of this type operate under different conditions of stroke and rate of stroking is briefly given. J. W. H.

754. Acid sludges regenerated to make 98% H_2SO_4. F. L. Resen. *Oil Gas J.*, 18.1.54, **52** (37), 101.—The sulphuric acid regeneration unit of Consolidated Chemical Industries, Baton Rouge, La., is described.

The plant receives acid sludges from a variety of refinery operations; thus eliminating burning of sludges in boilers and operating hydrolysing and concn units, 98% H_2SO_4 is produced. A table shows analysis of sludges used, and a schematic flow diagram is given. G. A. C.

755. Patents. U.S.P. 2,655,136 (24.10.50; 13.10.53). M. W. Barnes, assr to Universal Oil Products Co. Heating apparatus for affecting the heating of a plurality of fluid streams in radiant and convection zones. D. A. R.

DISTILLATION

756. Patents. U.S.P. 2,643,218–19 (16.6.49; 23.6.53). Standard Oil Development Co. Oil shale is dist as a turbulent dense mass fluidized by upwardly flowing gases and heated by hot particles obtained by burning fluidized dist residue *A* in a combustion zone *B* and then treating it with a reducing gas at 900°–1200° F for 1–10 min.

In U.S.P. 2,643,219, combustion of *A* is effected by passing gas upwardly in lower part of *B* at a superficial linear velocity of substantially $<1{\cdot}5$ ft/sec to segregate 400–700 μ from $<400\ \mu$ dia particles, and then at $>1{\cdot}5$ ft/sec in upper part of *B* so that 0–20 μ fines are fully entrained and removed overhead, leaving fluidized 20–400 μ dia particles for recycling. V. P. P.

U.S.P. 2,656,310 (20.12.49; 20.10.53). L. L. Henning, assr to California Research Corpn. A process for fractionally dist a mixture comprising alkyl aryl hydrocarbons having a wide boiling range, aromatic hydrocarbons, and HF. D. A. R.

ABSORPTION AND ADSORPTION

757. Patents. U.S.P. 2,642,153 (2.4.51; 16.6.53). Eastman Kodak Co. Separation of propene–propane mixtures containing 2–75% propene by absorbing the mixture on silica gel at $>30°$ C, then heating to 35°–50° C to desorb substantially pure propane, then to 55°–70° C to desorb propane with some propene and finally to 75°–150° C to obtain a propene rich fraction.

U.S.P. 2,643,972 (2.4.51; 30.6.53). Phillips Petroleum Co. Continuous adsorption–desorption process.

U.S.P. 2,644,018 (16.12.49; 30.6.53). Sun Oil Co. Continuous adsorption process.

U.S.P. 2,642,955 (25.6.47; 23.6.53). Aluminum Co of America. Cyclic method for removing an adsorbable component from a gas mixture.

U.S.P. 2,643,217 (26.3.52; 23.6.53). Standard Oil Development Co. Production of high V.I. lub oil by alternately charging to a bed of silica gel a lub oil fraction *X* containing paraffinic, single and condensed ring naphthenic, and single and condensed ring aromatic hydrocarbons, and an aromatic hydrocarbon fraction *Y* of lower b.p., and alternately recovering a fraction *A* of mainly saturated lub oil components and a fraction *B* of mainly aromatic lub oil components. *A* is fed alternately with a paraffinic fraction of lower b.p. than *Y* to a bed of activated carbon, from which is alternately recovered a fraction *C* of mainly condensed ring naphthenic lub oil components and fraction *D* of paraffinic and single ring naphthenic lub oil components. *B* is fed alternately with an aromatic hydrocarbon fraction of lower b.p. than *X* to a bed of alumina gel, from which is recovered a fraction *E* of single ring aromatic lub oil components and a fraction of condensed ring aromatic lub oil components. *D* and *E* are combined and a high V.I. lub oil recovered therefrom.

U.S.P. 2,641,574 (21.7.49; 9.6.53). Standard Oil Co, Ohio. Decolourizing of moisture-containing oil with powdered contact agents *A*, such as clay, which tend to cake in contact with the moisture, is effected by feeding *A* to the bottom of a constant head zone, where it is maintained as a fluidized agitated mass by introducing a gas.

U.S.P. 2,642,154 (G.B. 14.8.50; 16.6.53). I.C.I. Ltd. Separation of gaseous mixtures by absorption of one constituent thereof in a liq absorbent which is regenerated by adding an additional liq and raising the temp. V. P. P.

SOLVENT EXTRACTION AND DEWAXING

758. Patents. U.S.P. 2,626,959 (6.2.51; 27.1.53). J. A. Chenicek, assr to Universal Oil Products Co. Process for extracting hydrocarbon mixtures containing an olefin *A* in which one of the ethylenic carbon atoms is substituted by dialkyl or monophenyl, which comprises contacting the mixture in liq phase at 0°–50° C with a solvent containing ≮1 mol of an aliphatic nitrile *B*, based on *A*, and 10–30 wt % conc H_2SO_4 based on *B*, and separating a raffinate of unreacted hydrocarbons and an extract containing the reaction product of *A* and *B*.

U.S.P. 2,626,889 (22.11.48; 27.1.53). C. C. Carney, assr to Phillips Petroleum Co. Method and apparatus for liq–liq contacting in which a heavy liq *A* and a light liq *B* are flowed in counter-current through a mixing zone, where they are centrifuged to establish an interface *C* between *A* and *B*, droplets of *B* from a region in the *B* phase being continuously passed through *C* into *A* and droplets of *A* from a region in the *A* phase being continuously passed through *C* into *B*.

U.S.P. 2,626,230–1 (16.9.47; 20.1.53). E. W. Clarke, assr to Atlantic Refining Co. A wax-containing mixture *M* is separated into fractions of higher (*A*) and lower (*B*) m.p. by countercurrent extraction with a solvent *C* and additives *D* at a temp such that 2 immiscible liq phases are produced, one containing *A*, *C*, and D_1, and the other containing *B*, *C*, and *D*. The inlet for *C* is near the outlet for *A*; inlet for D_1 is adjacent to inlet for *M*; inlet for D_2 is between inlet for D_1 and outlet for *B*. In 2,626,230, *C* comprises 3·2–3·8 vol phenol/vol *M*; D_1 comprises 0·3–0·5 vol cresol/vol M_1 and D_2 comprises 0·3–0·5 vol cresol/vol *M*. In 2,626,231, *C* comprises 1·8–2·2 vol nitrobenzene containing a small proportion of furfural per vol *M*; D_1 comprises 0·3–0·5 vol furfural/vol *M*; D_2 comprises 0·45–0·55 vol of C_{8-15} paraffin hydrocarbon/vol *M*.

U.S.P. 2,625,502 (24.7.48; 13.1.53). P. S. Backlund and V. N. Jenkins, assrs to Union Oil Co of California. Normally cryst pet wax, pptd in gelatinous form from soln in an aromatic (hydrocarbon) solvent *A*, *e.g.* benzene, toluene, is converted into filterable form by contacting with a wax anti-solvent *B* (≮1 part *B*: 1·5 parts *A*), preferably at 25°–75° F. *B* may be acetone or M.E.K.

U.S.P. 2,644,006 (Neth. 18.3.48; 30.6.53). Shell Development Co. Separation of water-insol C_{4-10} oxyhydrocarbons from mixtures with liq hydrocarbons produced in Fischer–Tropsch process, by selective extraction with formic acid, with or without water.

U.S.P. 2,642,341 (10.8.50; 16.6.53). Standard Oil Development Co. A liq–liq contacting tower *T* contains a plurality of vertically displaced plate members *P*, each of which comprises an imperforate plate *A* fixed to *T*, a second perforated plate *B* fixed to *A* in upwardly inclined relation, and a third imperforate plate joined to *B* extending across *T* in spaced relation to the opposite side of *T*, successive *P*s being attached to opposite sides of *T*.

U.S.P. 2,642,377 (27.10.47; 16.6.53). Shell Development Co. Dewaxing lub oil containing microcryst and normal paraffin waxes by contacting with urea at 25°–60° C to form wax–urea complexes.

U.S.P. 2,642,378–9 (13.9.49; 16.6.53). Socony-Vacuum Oil Co. Separation of (*a*) wax, (*b*) wax and asphalt, from residual lube oil stocks by contacting with urea in soln in: (*a*) *p*-cresol at *ca* 125° F; (*b*) a mixture of cresylic acids at *ca* 125° F.

U.S.P. 2,642,380 (5.7.51; 16.6.53). U.S.A. (Secretary of the Interior). A hydrocarbon wax containing ≮20% of olefinic hydrocarbons and having a m.p. >90° F is obtained by solvent extracting a dist fraction of b.p. 675°–950° F of a crude oil obtained by destructive dist of oil shale, to recover the waxy material therein, and then separating at least part of the paraffinic content of the waxy material from the olefinic portion. V. P. P.

U.S.P. 2,654,692 (7.4.50; 6,10.53). W. Kiersted and H. H. Gross, assrs to Texaco Development Corpn. Solvent dewaxing.

U.S.P. 2,654,693 (27.2.51; 6.10.53). C. F. Sacra, assr to Shell Development Co. The process of dewaxing a substantially asphalt-free wax-containing mineral lub oil dist which comprises: cooling a liq admixture of the mineral oil dist and a dewaxing solvent consisting essentially of M.E.K. and propane, the solvent to oil volume ratio being from *ca* 4 : 1–6 : 1, and the ketone to propane volume ratio being from *ca* 3 : 2–4 : 1, to precipitate solid wax from the oil, and separating the precipitated wax. D. A. R.

CRACKING

759. Continuous method for the synthesis of mesitylene from acetone. K. A. Kobe and L. J. Hirth. *Petrol. Process.*, 1954, **9** (1), 92–6.—A continuous cat process for converting aliphatic to aromatic hydrocarbons is described. The reaction concerned is the condensation of acetone with itself to form mesitylene (1 : 3 : 5-trimethylbenzene). Yields have been reported in the region of 20%, based on the original acetone charge to the reactor. A relatively cheap cat, natural bauxite, was used in this instance, activated at 900° C, and it produced max yields of the product. Reaction conditions were 1000 p.s.i.g. and 700° F at an average space velocity of 0·35 c.c. acetone/c.c. cat/hr.

A table of summarized data is given which shows the different yields of product, depending on cat treatment, space velocity, pressure, and temp. J. W. H.

760. Patents. U.S.P. 2,642,466 (G.B. 28.7.49; 16.6.53). Shell Development Co. Production of olefins by vaporizing a waxy hydrocarbon at <500° C and thermally cracking the vaporized fraction at 500°–600° C in the presence of steam, the evaporator residue being thermally soaked at 390°–450° C for 0·25–4 hr and then subjected to the aforesaid vaporizing and cracking process.

U.S.P. 2,642,383 (20.5.49; 16.6.53). Universal Oil Products Co. In reforming a hydrocarbon fraction of b.p. <425° F by passing it with hydrogen through a cat comprising platinum, alumina, and combined halogen to effect hydrocracking of paraffins *A* and dehydrogenation of naphthenes, water is introduced at least during the later stages of the process and its partial pressure regulated to suppress any increased tendency toward *A* during the process and maintain the extent of *A* substantially constant throughout. U.S.P. 2,642,385 is concerned with a similar process, in which cat comprises platinum or palladium and a composite of silica with at least one metal oxide selected from alumina, zirconia, magnesia, and thoria.

U.S.P. 2,642,384 (22.7.49; 16.6.53). Universal Oil Products Co. Reforming a hydrocarbon stock boiling in gasoline range by contacting with hydrogen and a cat comprising platinum, alumina, and combined halogen at 750°–1000° F/50–1200 p.s.i., a halogen compound reactable with the alumina being introduced while the cat still retains substantial naphthene dehydrogenating activity to maintain the hydrocracking activity of the cat substantially constant throughout the process.

U.S.P. 2,643,214 (29.3.50; 23.6.53). Universal Oil Products Co. A hydrocarbon fraction boiling in gasoline range, containing paraffins and naphthenes, is contacted under reforming conditions with a Pt—and/or Pd—on alumina cat in presence of hydrogen. A hydrogen-rich gas is separated from the reformed product and is burnt, the hot combustion gases being used to heat cat withdrawn from the reaction zone to which the heated cat is recycled.

U.S.P. 2,643,971 (14.6.50; 30.6.53). Standard Oil Co, Chicago. Hydrocarbon charging stock of b.p.>b.p. of gasoline and containing polycyclic aromatics is heated with HF cat at 150°–400° F to produce HF-sol condensed aromatics of higher mol. wt., hydrogen, and a gas oil which is separated and cat (SiO_2) cracked to gasoline.

U.S.P. 2,643,216 (10.8.50; 23.6.53). Phillips Petroleum Co. Semi-continuous process for converting hydrocarbons by contacting with pebbles heated to 1200° F.

U.S.P. 2,643,980 (23.9.50; 30.6.53). E. J. Houdry. Preparation of cat wherein the active material is built up in a series of deposits produced by successive impregnations with a soln thereof, each later being coated with an impervious film of organic material which is removable by oxidn.

U.S.P. 2,643,215 (1.3.47; 23.6.53). Houdry Process Corpn. A hydrocarbon conversion cat, which has declined in cat activity after repeated conversion–regeneration cycles, is impregnated with a sealing liq and then separated by flotation in a liq of suitable density into 2 fractions. The fraction of lesser average particle density is the more cat active, and is added to untreated cat for effecting hydrocarbon conversion.

U.S.P. 2,643,231 (28.1.50; 23.6.53). Sinclair Refining Co. Preparation of a cracking cat by treating a hydrogel of silica–alumina or silica–magnesia in bead form with an aq soln containing 0·1–0·5 wt % of a surface active agent (alkylaryl sulphonate or sulphonated alkyl succinate) prior to the drying process.

U.S.P. 2,642,401 (15.2.49; 16.6.53). California Research Corpn. Method of preparing fresh molybdena–alumina cat from the spent cat.

U.S.P. 2,642,337 (9.6.48; 16.6.53). Aluminum Co of America. Cryst alumina hydrate is converted to α-alumina by heating in contact with steam at 400°–550° C/350–2500 p.s.i. V. P. P.

U.S.P. 2,656,305 (16.3.50; 20.10.53). C. K. Viland, assr to Tide Water Associated Oil Co. A process of cat cracking hydrocarbons wherein a body of powdered cat in the form of a fluid bed is contacted with hydrocarbon vapours to be cracked. D. A. R.

HYDROGENATION

761. Patent. U.S.P. 2,642,463 (30.1.51; 16.6.53). E. I. du Pont de Nemours and Co. Hydrogenation of organic compounds is effected at 25°–500° C in contact with a Ni, Co, Fe, Cu, Zn, Ag, Cd, Mn, or Sn salt of a tungstic acid of formula H_2WO_4 or H_2WO_3. V. P. P.

POLYMERIZATION

762. Patents. U.S.P. 2,642,467 (11.5.50; 16.6.53). Phillips Petroleum Co. Hydrocarbons which can be hydrogenated to high ON fuel components are produced by copolymerizing 2-butene with *iso*butene in a mol ratio of 5–14 : 1 in contact with a silica–alumina cat promoted with a nickel or cobalt oxide until the activity of the cat and the yield of polymer have appreciably decreased, and then increasing the mol ratio of 2-butene to *iso*butene to 18–25 : 1 and continuing the reaction until the cat is too inactive to be considered for further use.

U.S.P. 2,642,402 (20.5.50; 16.6.53). Standard Oil Development Co. Olefin polymerization cat consisting essentially of 50–90 wt % of a phosphoric acid *A* on a silica gel base *B* is prepared by heating *B* at 400°–1250° F for $\leqslant 2$ hr, then mixing with *A*, pulverizing the mixture, drying at 375°–425° F, and finally calcining at 600°–1000° F.

U.S.P. 2,642,382 (24.11.50; 16.6.53). Houdry Process Corpn. Refining hydrocarbon oils by treatment in liq phase with a minor proportion of a conc aq soln of ferric chloride extended with a conc soln of magnesium, calcium, or sodium chloride, and separating the resulting sludge. V. P. P.

Ger.P. 895,762, 24.9.53. Clar and Geise, assrs to Ruhrchemie A.G., Oberhausen-Holten. Method for processing the cat residue from olefin polymerization to lub oils with $Al(Cl)_3$.

Ger.P. 895,763, 24.9.53. Clar, Geise, and Kühnel, assrs to Ruhrchemie A.G., Oberhausen-Holten. Process for olefin polymerization with materials containing metal halides.

BrennstChemie, 1953, **34** (19–20). R. T.

CHEMICAL AND PHYSICAL REFINING

763. Patents. U.S.P. 2,642,421 (13.9.49; 16.6.53). Socony-Vacuum Oil Co. Urea or thiourea separation process wherein the reactants are mixed in aq acetic acid, the concn of which ranges from *ca* 20–70 wt % for 10° C reaction temp, to 88 wt % at 25° C and to 100 wt % at 40° C.

U.S.P. 2,642,422 (13.9.49; 16.6.53). Socony-Vacuum Oil Co. Separation of a straight chain compound *C* of formula

$$X^1(CH_2)_{r+1}CHX(CH_2)_mCH_3$$

wherein X, X^1 = monovalent groups each of length $<2{\cdot}3$ Å, *r* and *m* are integers whose sum is >4, from a mixture with a straight chain compound *D* of formula

$$H_3C(CH_2)_sCHX''(CHX''')_tCHX''''(CH_2)_uCH_3$$

wherein X″, X‴, and X⁗ are monovalent groups, $\leqslant 2$ being present, and *s*, *t*, *u* are integers whose sum is >4, by forming a urea–*C* complex.

U.S.P. 2,642,423 (13.9.49; 16.6.53). Socony-Vacuum Oil Co. Cryst complex of urea and a straight chain mono-olefin with $\leqslant 6$ carbon atoms in the chain.

U.S.P. 2,642,424 (12.11.52; 16.6.53). Socony-Vacuum Oil Co. Highly branched chain aliphatic hydrocarbons, $C_{\leqslant 8}$ *cyclo*paraffins, $C_{\leqslant 8}$ *cyclo*-olefins, and methyl, *iso*propyl, and *tert*-butyl derivatives of the cyclic hydrocarbons are separated from non-complex forming hydrocarbons by forming a thiourea complex at −10° to −30° C. V. P. P.

U.S.P. 2,645,602 (17.3.50; 14.7.53). T. B. Tom and J. H. Krause, assrs to Standard Oil Co. Mercaptans are removed from hydrocarbon dist boiling above the gasoline range by contacting with an aq soln of KOH having a concn of 50–60% wt, introducing oxygen stoichiometrically equivalent to the mercaptans present, maintaining the temp at 100°–125° F, and separating the spent KOH soln.

U.S.P. 2,645,603 (1.3.50; 14.7.53). J. M. Cranmer, assr to Socony-Vacuum Oil Co. Internal oxidn of mercaptans to polysulphides in gasoline is inhibited by adding N : N¹-di-*sec*-butylphenylenediamine to the gasoline, contacting the gasoline with an alkaline soln in the absence of air, separating the spent alkaline soln, and regenerating it.

U.S.P. 2,646,388 (20.4.51; 21.7.53). V. L. Crawford, assr to Gulf Research and Development Co. Hydrodesulphurization process using a nickel cat on a porous support. The cat is regenerated by combustion followed by reduction with steam and a reducing gas.

U.S.P. 2,646,389 (8.3.50; 21.7.53). G. H. Weisemann, assr to Standard Oil Co. Mercaptans are removed from hydrocarbon dist boiling above the gasoline range by dispersing a copper cat in the dist and contacting at 80°–125° F with 1–15% vol of an aq soln of KOH having a concn of 50–60% while introducing free oxygen stoichiometrically equivalent to the mercaptans present.

U.S.P. 2,646,390 (16.12.50; 21.7.53). R. C. Arnold and A. P. Lien, assrs to Standard Oil Co. Desulphurization of dist fuels by contacting at −20° to −40° C with 0·5–3 g mol of anhyd aluminium chloride per g atom of sulphur in the fuel, in the presence of sufficient liq SO_2 to form raffinate and extract phases, separating the phases, and recovering the fuel from the raffinate.

U.S.P. 2,646,404 (2.12.50; 21.7.53). W. B. Hughes and E. B. Fisher, assrs to Cities Service Research and Development Co. Petroleum water-in-oil emulsions are broken by the action of a material made by reacting 1 mol of an aldehyde or ketone with 2 mol of an alkylamine, alkanolamine, or heterocyclic amine, separating water from the reaction product, and neutralizing the latter with propylated naphthalene sulphonic acid.

U.S.P. 2,646,405 (31.1.50; 21.7.53). W. B. Hughes, assr to Cities Service Oil Co. Petroleum water-in-oil emulsions are broken by the action of a composition consisting of 90–99% of an emulsion breaker and 1–10% of a material made by reacting 1 mol of a glyceride of a hydroxy acid with 2 mol of

triethanolamine at *ca* 180° C and neutralizing the product with a hydroxy acid.

U.S.P. 2,646,406 (16.2.50; 21.7.53). W. B. Hughes, assr to Cities Service Oil Co. Petroleum water-in-oil emulsions are broken by the action of a heat-polymerized basic hydroxy monoamine neutralized with a high mol aliphatic hydroxy acid.

U.S.P. 2,646,451 (1.11.49; 21.7.53). R. H. Rommel, assr to Sun Oil Co. Continuous process for separating a liq mixture of organic components of different adsorbabilities by means of a selective adsorbent.

U.S.P. 2,647,150 (10.3.48; 28.7.53). R. J. Askevold, assr to Pure Oil Co. Separation of alcohols from mercaptans using a granular solid adsorbent. J. M. S.

SPECIAL PROCESSES

764. Hydrocarbon conversion by oxygen steam carbon dioxide, for the industrial manufacture of hydrogen. L. Marcu. *Chim. et Industr.*, 1953, **70**, 397–405, 677–93.—Main H_2 requirement is for synthetic fuels and NH_3. Pre-war chief cources of H_2 were coal carbonization (55%), liquefaction of coke-oven gas (26%), and electrolysis (16%). Recently hydrocarbons (mainly natural gas CH_4) are providing increasing quantities. Theoretical aspects of CH_4 conversion are considered, with composition diagrams, followed by a review of industrial processes (including flow diagrams) for preliminary purification (S removal) of feed gas, partial combustion, conversion by H_2O, by CO_2 and by $CO_2 + H_2O$, interaction of CO and H_2O, and purification of synthesis gas and of H_2. Probable future trend is to further development of partial combustion processes, owing to lower energy requirements and simpler constructional problems of such plants. 102 refs. V. B.

765. New process for separation of isomeric hydrocarbons. P. W. Sherwood. *Chim. et Industr.*, 1954, **71**, 81–4.—*Cf.* Abs. **2025**, 1953.

766. Patents. U.S.P. 2,624,693 (25.11.50; 6.1.53). S. W. Ferris, assr to Sun Oil Co. Preparation of a microcryst wax m.p. 105°–120° F having extreme flexibility by dist slack wax to remove components boiling $<550°$ F/10 mm Hg, dissolving the residuum in a solvent with heating, cooling to 58°–62° F, whereby a portion of the wax is pptd, separating the ppt and cooling the residual soln to 36°–43° F, whereby further wax is pptd and is then separated, washed with solvent, and finally freed from solvent.

U.S.P. 2,626,276 (13.12.47; 20.1.53). H. J. Hibshman, assr to Standard Oil Development Co. Gaseous products of Fischer–Tropsch process are scrubbed with a SO_2-insol non-aromatic hydrocarbon and the resulting soln extracted with liq SO_2 to produce an extract containing aliphatic oxygenated compounds and a raffinate containing paraffinic hydrocarbons.

U.S.P. 2,625,560 (24.9.47; 13.1.53). V. F. Michael, assr to Stanolind Oil and Gas Co. A hydrocarbon soln of an oil-sol carboxylic acid, a preferentially oil-sol alcohol *A*, and <1 aldehyde and/or ketone, is separated by extracting with aq alkali metal bisulphite and a solubilizer for *A* consisting essentially of a bisulphite adduct of an aldehyde or ketone at pH 2·2–8·0, separating *A* from the aq extract and heating residual extract to above the decomp temp of the bisulphite adduct.

U.S.P. 2,642,454 (23.11.49; 16.6.53). Phillips Petroleum Co. Acetonitrile is prepared by passing a mixture of 1 mol of a C_{3-8} paraffin with 0·3–5 mol ammonia in vapour phase at 800°–1000° F/15–250 p.s.i.g. for 0·5–10 sec into contact with a cobalt molybdate pptd on alumina gel cat containing 5–25% cobalt molybate on a dry basis.

U.S.P. 2,643,266 (18.7.45; 23.6.53). Sinclair Refining Co. Production of organic nitrogen compounds, including nitriles, by passing an olefin mixed with excess ammonia through a bed of pelleted or granular cat consisting of reduced cobalt oxide on diatomaceous earth and having a bulk density of 0·75–1·3, a surface area as determined by the nitrogen absorption isotherm >120, a Na content $>1·0\%$, SO_4 content $>0·2\%$, and Cl content $>0·1\%$.

U.S.P. 2,644,016 (12.11.49; 30.6.53). Ethyl Corpn. Chlorination of ethane by passing a mixture of 0·4–1·3 parts by vol (pbv) of chlorine, 1 pbv of ethane, and 1–6 lb/cu. ft. of fully suspended graphite powder of 50–250 μ particle size through a reaction zone at 400°–500° C at a gas velocity of 4–10 ft/sec.

U.S.P. 2,643,272 (4.1.47; 23.6.53). Shell Development Co. High temp substitution halogenation (Cl, Br) process in which a vaporous feed mixture of halogen and organic compound (*e.g.* propylene) is rapidly heated by being mixed with the reaction effluent.

U.S.P. 2,643,938 (18.8.47; 30.6.53). Phillips Petroleum Co. Spent sulphuric acid is treated with nascent oxygen obtained by introducing a mixture of an oxidizing agent and hot combustion gases at 1100°–3000° F into the acid, whereby carbonaceous impurities and some water are removed.

U.S.P. 2,643,939 (G.B. 15.9.48; 30.6.53). Anglo-Iranian Oil Co. Process for recovering sulphur in which sulphur-contaminated metallic cat is regenerated at *ca* 1100° F in a current of steam and air and the effluent cooled to 60°–80° F to effect reaction of SO_2 and H_2S present and thereby produce sulphur, the reaction mixture free from gaseous products being passed into water, where the sulphur settles out.

U.S.P. 2,642,381 (27.8.49; 16.6.53). M. W. Kellogg Co. In chemical reactions involving exothermic *A* and endothermic *B* steps, in which *A* is effected at a temp not higher than that of *B* and the heat released by *A* is not equiv to the heat required by *B*, the heat required by *B* is supplied by indirectly contacting *A* with a vaporizable heat exchange liq *C* under a pressure such that *C* is vaporized at a temp suitably related to the reaction temp of *A*, vaporized *C* is compressed at a pressure suitably related to the temp of *B* and indirectly contacted with *B*, and the condensate of *C* is returned at a lower pressure for heat exchange with *A*, part of *C* being withdrawn and its heat content regulated to balance the heat requirements of the system and then returned. The method is applicable to such processes as hydrodesulphurization and hydroforming, selective oxidn of sulphur and hydroforming, hydrogenation and hydroforming, etc.

U.S.P. 2,642,346 (28.9.46; 16.6.53). Hydrocarbon Research Inc. Process and apparatus for conducting high temp exothermic reactions of gaseous reactants, *e.g.* production of synthesis gas from hydrocarbons and oxygen.

U.S.P. 2,643,183 (6.6.47; 23.6.53). Standard Oil Development Co. Reactor having non-plugging valve nozzle.

U.S.P. 2,640,532 (8.10.49; 2.6.53). W. S. Bowen. Reaction furnace and evaporator in which high velocity, unidirectional vortices of flame and finely divided solid particles are established within an upright cyl combustion chamber *A*. This is effected by injecting fuel tangentially into the upper part of *A* to establish a descending flame vortex therein, and tangentially injecting, preferably at a lower point, finely divided materials to be evaporated or treated to provide a second descending vortex moving in the same angular direction as the flame vortex and intimately commingling therewith to form a single descending vortex, any relatively dense particles being segregated towards the wall by tangential force for removal through a lateral skimming slot at the bottom.

U.S.P. 2,643,205 (27.12.49; 23.6.53). Pure Oil Co. Carbonaceous deposits are removed from surfaces of chemical process equipment by *ca* 30 minutes treatment with spent alkylation sulphuric acid and then flushing with water.

U.S.P. 2,642,956 (23.11.44; 23.6.53). R. C. Bour, assr to National Cylinder Gas Co. Acetylene is recovered from gases containing it by scrubbing the gases with an ester of phosphoric acid derived from a $C_{>6}$ alcohol.

U.S.P. 2,644,017 (29.6.51; 30.6.53). Standard Oil Co. Disproportionation of diethyl benzene *A* by heating with <1

mol BF_4 per mol of *A* and sufficient HF to dissolve the *A*–BF_3 complex, at $<100°$ F to produce 1 : 3 : 5-triethylbenzene.

U.S.P. 2,641,450 (19.10.46; 9.6.53). Hydrocarbon Research Inc. Method of transferring heat or cold from one gaseous medium to another by a powdered thermophore in a state of dense phase fluidization.

U.S.P. 2,641,534 (14.12.50; 9.6.53). Phillips Petroleum Co. Carbon black furnace.

U.S.P. 2,643,161 (13.4.49; 23.6.53). Houdry Process Corpn. Separating fluent granular particles *G* from lift gas by means of which it has been lifted through a confined path *P* and discharged into a considerably wider zone *Z* by allowing *G* to fall from the discharge point of *P* to the surface of a bed of *G* maintained in *Z*, from the bottom of which *G* is continuously withdrawn.

U.S.P. 2,643,182 (21.7.50; 23.6.53). J. Williams, assr to J. M. Huber Corpn. A burning mixture of a gaseous hydrocarbon and an oxygen-containing gas (25–80% of amount for complete combustion) is fed into one end of an elongated reaction chamber *C* to produce a mixture *A* of furnace black suspended in hot combustion gases. Uncalcined channel black is fed into *A* at the rate of 1 lb to <30 cu. ft. of gas so as to suspend it immediately in *A* and bring the resulting suspension *B* to 850°–2000° C. *B* is maintained at this temp for 0·1–5 sec, and is then removed from *C*, cooled to $<800°$ C, and the mixture of calcined channel black and furnace carbon black separated from gas.

U.S.P. 2,642,343 (9.4.48; 16.6.53). Phillips Petroleum Co. Pellets of chain structure carbon black, sufficiently hard to withstand bulk shipment, are produced by passing unsized pellets as subsequently obtained together with flocculent carbon black at 175°–300° C through a horizontal cyl rotating at an optimum rate for pellet formation. Pellets of all sizes up to ½-inch dia are withdrawn, half being recycled at a recycle rate of ½–1 and the rest being passed through a horizontal cyl rotating at a higher speed.

U.S.P. 2,642,448 (16.11.48; 16.6.53). Standard Oil Development Co. In a Fischer–Tropsch process using fluidized iron-type cat particles of 40–200 μ size having a wt mean average particle dia $D > 50\ \mu$, max conversion is obtained by maintaining a cat bed of $D = 30$–$50\ \mu$ in the reaction zone. This is effected by adding 40–200 μ cat particles at a rate inversely proportional to their average particle size to a fluid bed of more finely divided cat and continuously withdrawing contaminated cat.

U.S.P. 2,642,340 (10.5.46; 16.6.53). Standard Oil Development Co. Method of producing oxygen in which air is blown through a fluidized bed of solid oxygen acceptor *A* (metal or oxidizable metal oxide) and is then passed through a second fluidized bed of *A*, in which fuel is burnt to provide heat. Oxidized *A* is then withdrawn from both beds and decomposed in presence of steam to produce oxygen.

U.S.P. 2,640,358 (11.12.47; 2.6.53). Sun Oil Co. Apparatus for collecting samples of gas at a constant or predeterminably variable rate over any desired period of time.

V. P. P.

U.S.P. 2,644,745 (1.4.47; 7.7.53). C. E. Hemminger, assr to Standard Oil Development Co. Production of gases containing CO from finely divided carbonaceous materials and steam and/or CO_2.

U.S.P. 2,644,769 (31.12.48; 7.7.53). S. P. Robinson, assr to Phillips Petroleum Co. Process for coating fluidizable ammonium nitrate crystals (I) with fuller's earth, diatomaceous earth, kieselguhr, or calcium carbonate (II). I and II are electrostatically charged with charges of opposite sign and suspended in separate streams of inert carrier gas and the streams passed to a coating zone to form a fluidized bed.

U.S.P. 2,644,797 (9.12.47; 7.7.53). W. H. Shiffler, assr to California Research Corpn. Sulphuric acid wastes from the refining of pet dist are burnt at above 2200° F to produce hydrogen sulphide.

U.S.P. 2,644,810 (29.6.49; 7.7.53). H. S. Beretvas, assr to Standard Oil Co. Unsaturated monoesters of aliphatic carboxylic acids are sulphurized by reacting with a sulphur chloride in the presence of water.

U.S.P. 2,644,811 (30.7.49; 7.7.53). H. S. Beretvas, assr to Standard Oil Co. Oxygenated aliphatic compounds having a small degree of unsaturation but a Hanus iodine number >45 are sulphurized by the method of U.S.P. 2,644,810.

U.S.P. 2,644,825 (5.8.49; 7.7.53). H. S. Beretvas, assr to Standard Oil Co. Unsaturated fats and fatty acids are sulphurized by the method of U.S.P. 2,644,810.

U.S.P. 2,644,827 (31.8.51; 7.7.53). C. M. Neher, F. L. Padgitt, and P. E. Weimer, assrs to Ethyl Corpn. T.E.L. is made by feeding an alkali metal alloy of lead and a liq ethylating agent to an ethylation zone, agitating the mixture only sufficiently to maintain the reacting and reacted solids in non-uniform distribution in a liq comprising a soln of T.E.L. in the ethylating agent, and withdrawing a slurry of solids in the liq.

U.S.P. 2,644,829 (6.12.48; 7.7.53). J. P. Hogan, assr to Phillips Petroleum Co. In the Fischer–Tropsch process using a fluidized cat, the cat is preconditioned by contacting for 5–15 hr with synthesis gas at 180°–340° C, at a pressure <5 atm and at a space velocity lower than that required to effect the synthesis reaction, and the pressure and space velocity are gradually increased as the initial activity of the cat decreases until the stage is reached when the synthesis reaction takes place.

U.S.P. 2,644,834 (Netherlands 30.12.49; 7.7.53). N. Max, assr to Shell Development Co. Nitriles are made by heating an alcohol and ammonia in the presence of a cat consisting of zinc, tungsten, nickel, vanadium, magnesium, titanium, or chromium sulphide.

U.S.P. 2,644,837 (27.4.51; 7.7.53). C. E. Schweitzer, assr to E. I. du Pont de Nemours and Co. Olefinic compounds from 2 to 6 carbon atoms are oxidized at superatmospheric pressure and at a temp $>100°$ C in the presence of an oxygen-containing gas, water, an inert liq hydrocarbon, and a recycled by-product produced in a previous oxidn.

U.S.P. 2,644,839 (18.6.47; 7.7.53). A. C. Zettlemoyer, W. C. Walker, and W. L. Stump, assrs to Food Machinery and Chemical Corpn. Esters are made by conducting mixed vapours of an alcohol and a carboxylic acid over a finely divided cat composed of an adsorbent carrier containing a salt of lead, zinc, or iron with the acid.

U.S.P. 2,644,840 (G.B. 7.8.48; 7.7.53). D. S. P. Roebuck, assr to Monsanto Chemicals Ltd. In the oxidn of alkyl aromatic hydrocarbons in the liq phase by gaseous oxygen using a peroxide initiator, a solid inorganic adsorbent is added to the liq phase in an amount sufficient to adsorb the oxidn inhibitors formed in the reaction but insufficient to adsorb the peroxide initiators.

U.S.P. 2,644,844 (25.1.50; 7.7.53). R. E. Brooks and R. C. Schreyer, assrs to E. I. du Pont de Nemours and Co. Branched chain primary heptadecyl alcohol *A* is made by reacting carbon monoxide, hydrogen, tetra*iso*butylene, and methyl acetate at 255°–275° C in the presence of cobalt acetate dissolved in the reaction mixture and at a pressure of 325–1500 atm. The product is a mixture of methanol and the acetate of *A*. *A* is isolated by methanolysis of the acetate.

U.S.P. 2,644,846 (11.12.48; 7.7.53). A. J. Johnson and A. J. Cherniavsky, assrs to Shell Development Co. Oxidn of hydrogen chloride in presence of an amphoteric metal chloride and a hydrocarbon chlorine acceptor.

U.S.P. 2,645,619 (14.12.51; 14.7.53). J. Hoekstra, assr to Universal Oil Products Co. Silica is prepared by forming a silica sol comprising alkali metal silicate, hexamethylene tetramine, water, and sufficient acid to give a pH of 4–5, and passing the soln in a finely divided condition into a suspending medium wherein the soln sets into firm hydrogel spheres.

U.S.P. 2,645,620 (1.11.47; 14.7.53). W. J. Paterson, assr to Lever Brothers Co. Nickel–alumina–silica cat are prepared by reacting an aq soln of a nickel salt, an aluminium salt, and alkali metal silicate at 75°–90° C, adding an aq soln of an alkali carbonate, washing, drying, and pulverizing the precipitate and reducing with hydrogen at 425°–550° C.

U.S.P. 2,645,655 (24.1.50; 14.7.53). F. G. Pearce, assr to Stanolind Oil and Gas Co. Recovery and purification of oxygenated organic chemicals from hydrocarbon soln thereof.

U.S.P. 2,645,656 (G.B. 19.7.49; 14.7.53). W. J. Oldham and M. M. Wirth, assrs to Anglo-Iranian Oil Co. Surface active agents are made by reacting a long chain alkyl hydroperoxide or alkyl naphthene hydroperoxide with SO_2 and reacting the hydrogen sulphates formed with a metal oxide, hydroxide or carbonate, or ammonia or an organic base.

U.S.P. 2,645,660 (16.5.51; 14.7.53). W. M. Drout and W. G. Emerson, assrs to Standard Oil Development Co. Excess acid process for the manufacture of esters.

U.S.P. 2,645,664 (G.B. 18.8.48; 14.7.53). D. J. Hadley and R. Heap, assrs to Distillers Co. Olefins are oxidized by passing them with an oxygen-containing gas over a copper-containing contact material in the presence of elementary selenium. Unsaturated aldehydes are formed. A deposit of a mixture of selenium and selenium oxide is also formed, and the selenium is separated from this deposit by subjecting it to a heat treatment at a temp >240° C in an inert atmosphere.

U.S.P. 2,645,667–8 (1.10.51; 14.7.53). E. E. Burgoyne and F. E. Condon, assrs to Phillips Petroleum Co. Condensation of primary alkanols by contacting with soda lime or calcium oxide. Higher alcohols are formed.

U.S.P. 2,645,671 (20.6.51; 14.7.53). L. A. Mattano, assr to Standard Oil Co. Stilbene and derivatives thereof are made by heating benzyl mercaptan or an alkyl or alkoxy substitution product thereof at a temp above 150° C in the presence of a sulphactive cat.

U.S.P. 2,646,442 (4.6.48; 21.7.53). M. T. Kendall, assr to Texas Co. Method of carrying out the Fischer–Tropsch process to increase the yield of normally liq products.

U.S.P. 2,647,138 (France 20.8.48; 28.7.53). W. Rottig, assr to Ruhrchemie Akt. Fischer–Tropsch process is carried out using a precipitated alkali-promoted cat which has been reduced with reducing gas. The cat contains 25–35% metallic iron, 50–61% ferrous oxide, 4–25% ferric oxide, and 0·5–5% acid alkali metal orthophosphate.

U.S.P. 2,647,139 (31.3.48; 28.7.53). W. P. Burton, assr to M. W. Kellogg Co. Separation of the products of the Fischer–Tropsch process by cooling to form an oil product liq phase (*A*) and a water product liq phase (*B*), scrubbing *A* with water to form a water layer (*C*) and an oil layer (*D*), extracting *D* with an aq alcohol to obtain a raffinate containing hydrocarbons, and an extract (*E*) containing oil-sol oxygenated compounds, subjecting *E* to hydrogenation to form a mixture of alcohols and ketones, separating the alcohols from the ketones, mixing *C* and *B*, and fractionating the mixture into high boiling acids and a low boiling mixture of alcohols, aldehydes, and ketones (*F*), hydrogenating *F*, and separating the alcohols from the ketones.

U.S.P. 2,647,149 (20.10.47; 28.7.53). P. C. Condit and J. A. Spence, assrs to California Research Corpn. The reaction between olefins, carbon monoxide, and hydrogen at <300° F is catalysed by a cat made by reacting, in the presence of water, a cobalt, iron, or nickel compound with carbon monoxide at 100–400 atm and 350°–450° F.

U.S.P. 2,647,151 (22.10.49; 28.7.53). R. T. Bell, assr to Pure Oil Co. Methanethiol is made by passing a mixture of methanol, H_2S, and H_2 over thoria supported on a carrier at 300°–450° C. J. M. S.

U.S.P. 2,655,464 (9.6.51; 13.10.53). J. W. Brown and C. E. Jahnig, assrs to Standard Oil Development Co. A process for converting a residual petroleum feed stock boiling predominantly above 900° F into lighter products and coke.

U.S.P. 2,655,465 (24.7.51; 13.10.53). H. Z. Martin, assr to Standard Oil Development Co. A process for converting a heavy hydrocarbon residuum stock into lighter products and coke, which comprises spraying the stock at *ca* 700°–850° F, through a dilute vapour phase into a lower dense, turbulent, coking bed of relatively coarse, fluidized, inert, solid particles maintained at *ca* 950°–1025° F.

U.S.P. 2,655,467 (27.5.52; 13.10.53). H. B. H. Cooper and E. C. Medcalf, assrs to American Cyanamid Co. Process for separating predominantly aromatic hydrocarbons from predominantly saturated hydrocarbons by extractive dist. D. A. R.

Ger.P. 895,764, 24.9.53. Guinot, assr to Les Usines de Melle, Melle, Deux-Sèvres. Process and plant for olefin hydration.

BrennstChemie, 1953, **34** (19–20). R. T.

METERING AND CONTROL

767. Remote indication of pressures, temperatures, and mechanical movements. Anon. *Mech. World*, Jan. 1954, **134** (3414), 29.—This new system has been developed from the electro-mechanical converter system, and contains no valves, barretters, or rectifiers, and introduces a small transducer with a wide range of applications. The apparatus and its installation are described. T. T.

768. Venturi tube *vs* **orifice plate.** D. T. McDonald. *Petrol. Process.*, 1954, **9** (1), 66–71.—The measurement of large volumes of gas flow has been accomplished with very satisfactory results using the Venturi meter rather than the conventional orifice plate flow meter. Experience with these meters in a natural gasoline plant at Premont, Texas, has shown that it is possible to effect direct savings in compressor H.P., due to smaller permanent head loss. Investment and installation costs may favour either of the 2 types of meter, depending upon the specific applications and the installer's construction standards.

The article deals with the theoretical, technical, and economic considerations of the problems met in deciding which type of meter is most suitable for the job in hand. J. W. H.

769. Automatic control of gas turbines. C. R. Ingemanson, A. Loft, and H. J. Wilt. *Oil Gas J.*, 16.11.52, **52** (28), 337.—Automatic control equipment is described for a 500-h.p. gas turbine designed for natural gas pipeline pumping.

A figure gives typical piping for the station. G. A. C.

770. Patents. U.S.P. 2,644,640 (8.6.51; 7.7.53). S. G. Eskin and A. M. Arkelyan, assrs to Robertshaw–Fulton Controls Co. Thermostatic control device for fluid fuel burners.

U.S.P. 2,644,641 (1.6.50; 7.7.53). A. Clarkson, assr (in part) to Vapor Heating Corpn. Boiler control system for proportionately controlling the delivery of fluid fuel to the fire chamber in relation to the delivery of feed water to the boiler.

U.S.P. 2,644,642 (18.5.49; 7.7.53). C. H. Smoot, assr to Republic Flow Meters Co. Combustion control system for a steam boiler supplied with a number of different fuels.

U.S.P. 2,645,461 (26.8.48; 14.7.53). C. W. Brown and P. V. Keyser, assrs to Socony-Vacuum Oil Co. Apparatus for controlling temp of a confined medium, using the cloud-point of an organic solution and light detecting means.

U.S.P. 2,646,681 (18.4.50; 28.7.53). R. G. Walton, assr to Shell Development Co. System for continuously measuring the temp of an optimum reaction region shifting within a reaction zone.

U.S.P. 2,647,251 (G.B. 21.12.49; 28.7.53). W. F. Archibald, assr to Distillers Co. Apparatus for indicating the level of solids in a container. J. M. S.

PRODUCTS

CHEMISTRY AND PHYSICS

771. Applied chemical kinetics. J. C. Jungers *et al. Rev. Inst. franç. Pétrole*, 1952, **7**, 111–22, 151–69, 198–216, 311–48; 1953, **8**, 3–16, 152–68, 561–85.—A series reproducing the course taught at the French Ecole Nationale Superieur du Pétrole and at the University of Louvain (Belgium). Chapter headings are: thermodynamics and chemical transformation; classification of reactions (activation of reactions, localization of reaction, intermediary active forces, reaction order, reaction mechanism); experimental methods of chemical kinetics (apparatus, principles, methods of measurement); determination of kinetic constants for simple and equilibrium reactions (rate constants, reaction order, activation energy, parallel reactions, consecutive reactions). Reading lists given. V. B.

ANALYSIS AND TESTING

772. German draft standard 51 849, "Test error and tolerance." W. Grote, W. Fritz, and B. Riediger. *Erdöl u. Kohle*, 1953, **6**, 557–64.—Standard, intended for petroleum products, is reproduced in full and its background discussed; definitions in many cases include the English equivalents. Standard is based on 3 σ limits. Standard includes examples of application, and addendum giving additional explanations and brief bibliography. V. B.

773. Further German draft test methods for liquid fuels. W. Bieler. *Erdöl u. Kohle*, 1954, **7**, 30–5.—Following draft standards are reproduced: DIN 51 766, test for H_2S; applicable to aromatic solvents which are shaken (5 minutes) with lead acetate soln. DIN 51 774, determining of bromine no. and sulphonatable components, based on ASTM 875–46T, and likewise intended for determination of olefins and aromatics. DIN 51 776, residue on evaporation (existent gum), based on ASTM D 381–50. V. B.

774. *n–d*–an. pt. method of oil analysis. II. Determination of naphthenic rings. L. Robert. *Rev. Inst. franç. Pétrole*, 1953, **8**, 586–9 (*cf* Abs. **1685**, 1952). % $C_N = -1573{\cdot}4\ n_D^{20} + 840{\cdot}15d_4^{20} - 0{\cdot}4619P + 1666{\cdot}2$. Mol. wt. $= 1705{\cdot}45n_D^{20} + 792{\cdot}93d_4^{20} + 4{\cdot}553P - 3287$; latter equation is applicable for mol. wt. 220–450, and yields values $\pm 10\%$ of these obtained by cryoscopy. V. B.

775. Units and dimensions, similitude, and scale-up in chemical engineering. R. Podhorsky. *Nafta* (*Yugoslavia*), 1953, **12** (4), 379–85.—The propositions and theorems of dimensional analysis are deduced from fundamental principles, and illustrated by examples from chemical engineering. The physical significance of dimensionless groups as the criteria of similitude is explained. The principles of the theory of models and its application to scale-up problems in chemical engineering are reviewed and illustrated by the example of fluid mixing. (Author's abstract.)

776. The determination of the non-volatile content of paint media. Anon. *J. Oil Col. Chem. Ass.*, Nov. 1953, **36** (401), 649.—A statistical analysis has been made of the results obtained for determinations of the known non-volatile contents of 5 media by an oven-heating method. Two variants of time, 3 and 4 hr, and 2 of temp, 110° and 130° C, were employed. 24 operators in different laboratories submitted about 1000 results. The variation from the known true value and the reproducibility of the methods was investigated. The best method proved to be heating for 4 hr at 110° C. The largest error is between the operators. Full descriptions of the methods and a set of instructions issued to each operator are appended. D. K.

777. Patents. U.S.P. 2,642,386 (5.4.49; 16.6.53). Sinclair Research Laboratories Inc. A laboratory continuous equilibrium flash still for the flashing of heavy oils.

U.S.P. 2,641,710 (2.3.51; 9.6.53). Shell Development Co. Analysis of gas mixtures by utilizing the difference in the ionization cross-sections A of the components. A is the effective area of a mol of gas presented to the impact of an ionizing particle and is determined by the size of the mol and the number of electrons in its constituent atoms, hence A determines number of ions produced. The strength of the electric current produced is therefore a function of the composition and total pressure of the gas.

U.S.P. 2,642, 536 (1.6.50; 16.6.53). Standard Oil Development Co. Improved detector assembly in apparatus for the multi-component infra-red determination of gaseous mixtures.

U.S.P. 2,642,478 (29.12.49; 16.6.53). W. E. Lasky, R. W. Seniff, M. A. Hanson, and H. E. Frank. Apparatus for determining water in petroleum based on electrical conductivity of the mixture. V. P. P.

CRUDE OIL

778. The constitution of a Middle East crude oil. W. van Klaveren *et al. Ingenieur, 's Grav.* 22.1.54, **66**, 1–4.—A crude oil sample was split into 45 fractions by using a simple p.p. still, described in the text, and a high vac fractionator. The composition of the various fractions was determined by recent graphical statistical methods. Apart from the *n–d–M* method, use was made of the relationship between kin. visc., n and d for determining the aromatic and naphthenic content of the various fractions. The results are summarized in a table, and a comparison is made between actual and calculated values. 5 figs, 2 tables. G. F. T. C.

779. Patent. U.S.P. 2,643,228 (2.10.48; 23.6.53). Cities Service Oil Co. Visc and flow characteristics of waxy crude oils at sub-atm temp are improved by adding the product obtained by reacting an aluminium salt of a $C_{<12}$ fatty acid (1 mol) and an alkylolamine (0·25–4 mol) containing <2 carbon atoms in each alkylol unit at 300°–500° C. V. P. P.

GAS

780. Compressing natural gas for Northern California. Anon. *Gas Oil Pwr*, 1953, **48**, 325.—Describes the movement of gas from the San Juan Basin, New Mexico, to N. California and Arizona.

In January 1953, 167 million cu. ft. of gas per day were moved through a 24-inch pipeline by means of 5 Worthington Uniflo UTC-165 gas engine compressors at the Navajo station. A further 5 units are being installed to raise the throughput to 267 million cu. ft., and in the future a 30-inch pipeline taking 400 million cu. ft/day will be constructed.

The present installation at Navajo receives gas at 500 p.s.i. from the San Juan Basin, 300 miles away, and compresses it to 845 p.s.i. for movement a further 285 miles to Arizona. Gas enters the station through 3 suction valves, one to a by-pass line and the others to horizontal oil scrubbers, from which it is passed to the compressors and coolers.

Each compressor unit has 5 vertical power cyl of 16-inch bore and stroke, driving 3 horizontal compressor cyl of 8½-inch bore and 16-inch stroke on the same crankshaft. The rated output at Navajo is 790 b.h.p. at 320 r.p.m., and the engines use as fuel gas which is tapped from the suction header and heated by the engine cooling water after pressure reduction. Double ignition at every power cyl is provided by 2 magnetos for each engine.

2 further gas engines each operating at 420 r.p.m. to give an output of 353 h.p. drive generators for aux power supplies. H. C. E.

781. Patent. U.S.P. 2,640,768–9 ((*a*) 25.6.48, (*b*) 11.5.48; 2.6.53). Phillips Petroleum Co. Automatically operating on and off control system (electric or hydraulic) for supplying air diluted gas (propane, butane, natural gas) to a gas holder,

e.g. of a city gas system, which is actuated by the movement of the gas holder caused by withdrawal or addition of gas. V. P. P.

ENGINE FUELS

782. Spark- and compression-ignition fuels in practice. J. Rössig. *Erdöl u. Kohle*, 1953, **6**, 581–2.—Main fuel and engine operational requirements are outlined. Contemporary German gasoline has O.N. 78. V. B.

783. The turbine fuel problem. Anon. *Aeroplane*, 30.10.53, **85** (2206), 613.—The problems involved in the use of a wide cut fuel (AVTAG, or JP4, to D.Eng. R.D.2486) in RAF turbine aircraft, instead of aviation kerosine (AVTUR, to D.Eng. R.D.2482) which was used formerly, are put forward. AVTAG was produced so that greater supplies of fuel could be readily and economically available at relatively short notice, but among its disadvantages are its higher fl. pt., its tendency to vaporize, its lower cal. val. than that of AVTUR, its wide sp. gr. tolerance, and its lower visc and consequent inferior lubricating properties compared with kerosine. It is considered, however, that these difficulties can be overcome. As far as civil turbine aircraft are concerned, AVTUR is still the fuel used, but here cost, availability, and freezing point are closely related, and the possibility of making use of domestic kerosine, or even a heavier type fuel, by employing tank heating are discussed. Typical properties of the various fuels, including domestic kerosine and gas oil, are tabulated. U. M.

784. Patents. U.S.P. 2,643,942 (19.9.49; 30.6.53). California Research Corpn. A light-stable gasoline containing a minor proportion $>0{\cdot}1\%$ of N : N′-dimethyl-*p*-phenylene diamine *A* to increase O.N. and 2–10% of a C_{3-4} alcohol or C_{3-6} ketone to prevent haze formation in daylight due to *A*.

U.S.P. 2,642,344 (15.7.50; 16.6.53). E. I. du Pont de Nemours and Co. Hydrocarbon fuel for C.I. engines containing 0·001–0·5 wt % of alkali metal *A* particles of size $>125\ \mu$ dia dispersed therein and 0·05–5 wt %, based on wt of *A*, of a compound ROX containing 5–31 C + O atoms wherein X = H or *A* and R contains only C, H, and O and is either a saturated or unsaturated, acyclic or alicyclic radical which may be unsubstituted or substituted by 1–3 C_{1-3} alkoxy groups, or an aromatic radical of the benzene and naphthalene series which may be unsubstituted or substituted by one C_{1-3} alkoxy group or by 1 or 2 C_{1-12} alkyl groups.

U.S.P. 2,642,345 (15.7.50; 16.6.53). E. I. du Pont de Nemours and Co. Diesel fuel additive consisting essentially of 0·001–65 wt % alkali metal particles *A* of $>100\ \mu$ dia dispersed in an inert hydrocarbon liq *B* containing an ethylene polymer *C* having a straight chain corresponding to a mol. wt. <558 in an amount $>$ solubility at $<40°$ C, the wt ratio of *C* : *A* being 1 : 25 to 10 : 1 and of *C* : *B* being $>1 : 1$. V. P. P.

U.S.P. 2,645,079 (6.6.44; 14.7.53). T. F. Doumani and C. S. Coe, assrs to Union Oil Co of California. Organic nitrites or nitrates are used as fuel for jet-propulsion motors.

U.S.P. 2,645,568 (21.4.49; 14.7.53). J. M. Godsey, assr to Socony-Vacuum Oil Co. Jet fuel consisting of a hydrocarbon dist having I.B.P. of 100° F and F.B.P. of 600° F, and 0·1–10·0% wt of a *tert*-butylthiophene.

U.S.P. 2,645,569 (28.4.49; 14.7.53). J. M. Godsey, assr to Socony-Vacuum Oil Co. Jet fuel comprising a hydrocarbon dist having I.B.P. of 40° C and F.B.P. of 315° C, and 0·1–2·0% wt of a fraction *A* boiling at 120°–125° C at a pressure of 2 mm mercury, obtained by reacting sulphur and *n*-butane, *n*-butene or butadiene at 450°–760° C, separating the thiophene tar from the product and isolating *A* from the tar.

U.S.P. 2,646,348 (15.12.51; 21.7.53). J. E. Neudeck, assr to Standard Oil Development Co. Gasolines containing dimethyl carbinol and liq hydrocarbon having a kauri–butanol solvent power above 20.

U.S.P. 2,646,349 (26.7.49; 21.7.53). D. A. Wagner, assr to Sinclair Refining Co. Light dist containing sulphurized tall oil.

U.S.P. 2,647,046 (24.5.49; 28.7.53). J. M. Godsey, assr to Socony-Vacuum Oil Co. Jet fuel comprising a hydrocarbon dist of I.B.P. *ca* 40° C and F.B.P. *ca* 315° C and 0·1–2·0% wt of thiophene tar. The thiophene tar is made by reacting sulphur and *n*-butane, a *n*-butene or a butadiene. J. M. S.

GAS OIL AND FUEL OIL

785. Patents. U.S.P. 2,654,660 (7.6.51; 6.10.53). E. Mitchell and A. P. Cramp, assrs to Gulf Research and Development Co. A fuel oil composition comprising a mixture of straight run and cracked dist fuel oils, and a minor amount, sufficient to inhibit sludge deposition from the mixture of oils, of a polyvalent metal salt of a monoamide of a dicarboxylic acid.

U.S.P. 2,656,259 (28.8.50; 20.10.53). H. G. Smith, T. L. Cantrell, and J. G. Peters, assrs to Gulf Oil Corpn. A fuel oil composition comprising a major amount of a hydrocarbon fuel oil and a minor amount, sufficient to stabilize the fuel oil against the formation of sludge, of the reaction product prepared by reacting an aq slurry of 1 mol of calcium hydroxide with from 2–4 mol formaldehyde and condensing the resulting product with from 0·5 to 1 mol of aniline and from 2 to 4 mol of a monoalkyl phenol having from 4 to 12 carbon atoms in the alkyl substituent.

U.S.P. 2,656,260 (28.8.50; 20.10.53). H. G. Smith and T. L. Cantrell, assrs to Gulf Oil Corpn. A fuel oil composition comprising a major amount of a hydrocarbon fuel oil and a minor amount, sufficient to stabilize the fuel oil against the formation of sludge, of the reaction product prepared by reacting, at a temp not exceeding 200° F, 1 mol of ammonium hydroxide with from 1 to 5 mol of formaldehyde and from 1 to 4 mol of a monoalkyl phenol having from 4 to 12 carbon atoms in the alkyl substituent. D. A. R.

LUBRICANTS

786. Use of the Petter AV 1 diesel engine for testing additive treated oils. A. Towle and P. E. B. Vaile. *J. Inst. Petrol.*, 1953, **39**, 581–622.—A 120-hr engine test has been developed for comparing straight and additive oils whose results bear a close resemblance to field experience under average service conditions. The engine, modifications, and test procedure are described, and there are photographs of test pistons. The procedure adopted for evaluating engine parts after test is described, and test results obtained from numerous investigations are analysed. A section is devoted to operating troubles encountered with the engine, and their remedies. A. R. W. B.

787. The evaluation of HD oils by means of small petrol engines. G. H. J. Simmons. *J. Inst. Petrol.*, 1953, **39**, 623–31.—Test procedures using the Lauson engine are described for evaluating straight mineral premium and HD lub oils. The degree of correlation with Caterpillar L-1 and Chevrolet L-4 tests is discussed, and the limitations of the Lauson in this respect analysed. It is concluded that the Lauson is a useful screening test engine. A. R. W. B.

788. The testing of I.C. engine lubricating oils by the BLOGRO engine under spark and compression ignition conditions. R. J. S. Perry. *J. Inst. Petrol.*, 1953, **39**, 632–7.—The engine and test procedure adopted are described, and a short appraisal of test data is given. A. R. W. B.

789. The development of an inexpensive engine test for examining the bearing corrosion and detergency aspects of additive lubricating oils. C. O. R. Bell. *J. Inst. Petrol.*, 1953, **39**, 638–49. Modifications to the Petter W.1 engine are described which enable it to be used as a screening test for the Chevrolet L-4 test. Test conditions and the results of

a statistical programme to rate the capability and reliability of the Petter W.1 are given. A formula has been obtained for predicting Chevrolet L-4 bearing weight losses from those obtained in the Petter test. A. R. W. B.

790. Lubricant for gas turbines. Anon. *Aeroplane*, 5.2.54, **86** (2220), 163.—The requirements of a gas turbine lubricant are discussed against the background history of Esso Aviation Turbo Oil 35. This is a synthetic oil, formerly known as E.E.L.3, with good load-carrying properties, small visc change with temp, high fl. pt., low volatility, and much lower vapour pressure than a standard mineral oil, and meeting specification D.Eng. R.D.2487. U. M.

791. Unusual lubricants. Anon. *Mech. World*, Jan. 1954, **134** (3414), 6.—A comparison of the principal features of phosphate coatings, molybdenum disulphide, and the silicone greases is given. Applications in each case are noted. T. T.

792. Patents. U.S.P. 2,642,452 (17.12.48; 16.6.53). Standard Oil Development Co. Synthetic lub oil of ASTM pour point $<-35°$ F, V.I. >125, visc <3 cs/210° F and fl. pt. $<450°$ F consists predominantly of C_{8-14} highly branched trialkyl esters of phosphoric acid derived from an OXO alcohol b.p. $<450°$ F obtained from hydrocarbon material containing >20 wt %, based on total olefin content, of an olefin of type $RHC{=}CH_2$, where R is a straight chain saturated hydrocarbon radical.

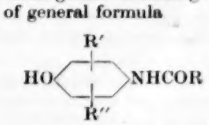
U.S.P. 2,642,395 (8.2.52; 16.6.53). Dow Corning Corpn. Boundary lubricant consisting essentially of (1) a liq copolymeric siloxane having >2 and <3 org radicals per Si atom, $<37\%$ being methyl radicals, and containing a halogenated phenyl or xenyl radical *A* substituted by 1–7 Cl or Br atoms, the remaining radicals being methyl or phenyl radicals, and the ratio of halogen atoms in *A* to Si being 0·05–5, and (2) 0·01–5 wt % based on (1) of a Cu, Mg, or Pb salt of a C_{4-9} aliphatic carboxylic acid or *cyclo*hexyl derivative thereof.

U.S.P. 2,643,261 (1.10.48; 23.6.53). Standard Oil Development Co. As a lub oil additive, an ester prepared by reacting pentaerythritol mono-oleate and a C_{1-30} monohydroxy-aliphatic alcohol with $POCl_3$, PCl_5, or $PSCl_3$ in the presence of pyridine and a solvent at a temp $>$ reflux temp.

U.S.P. 2,642,722 (25.5.49; 23.6.53). Tide Water Associated Oil Co. Cyl of reciprocating steam engines are lubricated by spraying into the saturated steam supplied to the engine a refined oil of visc 50–70 SUS/210° F containing 0·007–0·03% of a C_{8-18} alkyl acid phosphate, a temporary aq oil emulsion thereby being formed in the cyl. The exhaust steam is condensed and allowed to stratify, and the water layer is used as boiler feed water.

U.S.P. 2,643,979 (21.11.50; 30.6.53). Standard Oil Co, Chicago. Lubricant composition comprising hydrocarbon oil, 0·5–15% of an organic E.P. agent containing Cl, S, P, or mixtures thereof, which promotes formation of O-W emulsions, 0–10% asphalt, and 0·005–1% of a compound $(R)_4N$ halogen (wherein R is an alkyl, aralkyl, or aryl radical, or mixture thereof, $<$one R being a C_{1-3} alkyl and $<$one R being C_{1-3} alkyl) or a compound $D{:}NR'$ halogen (wherein $D{:}N$ is a heterocyclic compound and R′ is $C_{<8}$ alkyl) to prevent emulsion formation.

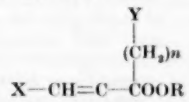
U.S.P. 2,642,397 (22.12.50; 16.6.53). Standard Oil Development Co. Lub grease consisting of lub oil thickened with a compound of general formula



wherein R = C_{14-22} alkyl, and R′ and R″ = H or C_{1-20} alkyl. V. P. P.

U.S.P. 2,655,462 (30.9.49; 13.10.53). O. Morfit, assr to M. W. Kellogg Co. Solvent treatment of lub oils to increase their V.I., by contacting oil with phenol to obtain a raffinate phase of improved V.I., and an extract phase comprised exclusively of extract oil, phenol, and water.

U.S.P. 2,655,479 (7.1.49; 13.10.53). J. C. Munday and D. T. Rogers, assrs to Standard Oil Development Co. A pour point depressant composition consisting essentially of a mixture of 20–80% of a first copolymer and 80–20% of a second copolymer, the first copolymer having an average side chain length of about 12·7 and being a copolymer of about 10% of an ester (*a*) of general formula



where X and Y are —H and COOR, *n* is an integer of value 0–1, and R is decyl, and *ca* 90% of an ester (*b*) of the formula aforesaid, wherein R is an alcohol radical derived from coconut oil alcohols of average chain length *ca* 13·5, the second copolymer having an average side chain length of *ca* 11·2 carbon atoms and being a copolymer of *ca* 60% of ester (*a*) and *ca* 40% of ester (*b*).

U.S.P. 2,655,549 (30.8.50; 13.10.53). L. M. Welch and G. H. Serniuk, assrs to Standard Oil Development Co. A pour point depressing lub oil additive prepared by admixing substantially equimolar proportions of a vinyl aromatic and a halo-alkane alkylating agent in a polar solvent, adding thereto a complex obtained by admixing a Friedel–Crafts cat with nitromethane or nitrobenzene, maintaining the temp of the mixture from $-20°$ to 50° C for a period of time sufficient to polymerize substantially all of the vinyl aromatic, and thereafter raising the reaction temp to 60°–100° C to obtain the desired final product. D. A. R.

BITUMEN, ASPHALT, AND TAR

793. Correlation and practical application of the results from the laboratory and coal by-product operation. High-temperature tar, from the laboratory and practice. W. Mantel and H. Hansen. *BrennstChemie*, 1953, **34** (9–10), 138–48. (*Report from main laboratory, Harpener Bergbau A.G., Lünen.*)—The thermal transformations of coal with increasing temp during coking by dry dist are described fully. Results of the investigation of the resulting high-temp tar are reported. Yields, quality, and composition of the tar are determined and correlations established. Results are supported by abundant tabulations and curves. 43 literature refs. R. T.

794. Roofing composition production. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (9), 250–3; **4** (10), 196–8; **4** (11), 322–8.—In Pt V treatment of roofing paper—cooling, dusting, rolling, etc., is discussed. Foreign installations and practice, with special reference to cutting and heating (oil or water), are compared. Transportation and fire protection are included.

In Pt VI tech directions on production and a review of working faults are given, with special emphasis on adequate steeping. Faults, causes, and remedies are tabulated.

Pt VIII includes a general discussion on single and multi-layer roofings, water sealing, intermediate layers, and adhesives. Abundant illustrations of sp structural applications are given. R. T.

795. Causes, avoidance, and removal of waves, wrinkles, bubbles, and other faults in covering with roofing compositions. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (8), 229–31; **4** (9), 257–8; **4** (10), 293–5; **4** (11), 309–10.—In Pt II the mechanics of large bubble formation with poured asphalt and the universally accepted theory are discussed. Precautions suggested are proper laying and substitution of roof sealing—not endangered by bubbles—for the roof covering.

In Pt III small bubble formation and surface disintegration

are considered. It is accepted generally that moisture in the top layer causes segregation of small bubbles. Causes postulated are: effect of moisture from the lining, the sealing layer, steeping and fillers, also moisture pen. Surface disintegration is discussed as a coarser continuation of small bubble formation. Elimination is discussed.

Pt IV. Bleeding, the discoloration, and changing of the top layer of a bituminous mass—not only of roofing paper—is caused by a solvent action arising from the lower strata. Other similar phenomena, but arising only at low temp, are discussed, *e.g.* incompatibility of special pitches and bitumens. Under the conception of bleeding all the phenomena may be summarized as separation and decomp, in which oil is separated from its original association. Preventive measures are unknown. Use of compatible materials is essential.

Pt V. Phenomena accompanying premature thinning and ageing of bitumen and tar roofings are: premature loss of dusting materials, weathering of the protective layer, in severe cases matting of the lining, and contraction of breadth. The influence of various factors on these phenomena is discussed. The author's summary of the series of articles follows. R. T.

SPECIAL HYDROCARBON PRODUCTS

798. Wax formation in the insulation of paper–oil condensers. V. T. Renne, V. M. Fainitskii, and D. S. Varshavskii. *Elektrichestvo*, 1953 (12), 55–8.—Examination of condensers withdrawn after 1–2 years service. Working stress was 12·5–15 kV/mm, oil breakdown strength was 20 kV/mm for new oil and 8 for some used oils. Check on ruptured condensers indicates that wax formation was max where oil layer thickest, rupture point is not necessarily linked with site of max wax. Rise in condenser p.f. is largely due to wax formation. V. B.

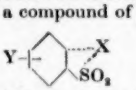
797. Waxing vinyl floors. C. S. Kimball. *Soap, N.Y.*, June 1953, **29** (6), 147.—Tests undertaken to investigate the claim that vinyl flooring needs no waxing are described. Several types of vinyl flooring and 3 floor waxes (conventional emulsion type, high resin content emulsion type, and liq solvent cleaner type) were examined. It was concluded that waxing improves gloss, does not alter slip resistance, improves soil resistance, and preserves the surface. Some difficulty was found in waxing new tile flooring with emulsion type wax because of poor wetting and spreading. M. V. J.

798. Patents. U.S.P. 2,626,227 (30.11.50; 20.1.53). J. A. Lambrech, assr to Union Carbide and Carbon Corpn. 3 : 5-Dimethylphenoxyethanol, 4-chloro-3 : 5-dimethylphenoxyethanol, and their use as systemic fungicides.

U.S.P. 2,626,211–12 (*a*) 4.1.50, (*b*) 8.2.52; 20.1.53). F. J. Sowa. (*a*) Weeds are killed by applying an aq soln containing 0·1–10 wt % of monoamino boron trifluoride *A* at the rate of 16 gal/1000 sq. ft. (*b*) Herbicidal composition comprising 1–50 parts by wt of ammonium fluoborate or *A* and 1–30 parts by wt of the ammonium or amine salts or esters of 2 : 4-dichlorophenoxyacetic acid or 2 : 4 : 5-trichlorophenoxyacetic acid, and a wetting agent.

U.S.P. 2,624,662 (24.10.51; 6.1.53). F. B. Erickson and A. H. Schlesinger, assrs to Monsanto Chemical Co. Herbicidal composition comprising an oil-in-water emulsion of a fluorine-substituted diphenyl sulphone.

U.S.P. 2,624,664 (25.2.50; 6.1.53). D. T. Mowry and A. H. Schlesinger, assrs to Monsanto Chemical Co. Herbicidal composition comprising a compound of formula



wherein Y = H or $-NO_2$ and X is a bivalent radical —RC=CR— or —RHC—CHR— completing a 5-membered ring, R being H, Cl, or Br.

U.S.P. 2,624,665 (24.10.51; 6.1.53). A. H. Schlesinger, assr to Monsanto Chemical Co. Herbicidal composition comprising an oil-in-water emulsion of dibenzothiophene-5 monoxide.

U.S.P. 2,624,666 (24.10.51; 6.1.53). M. Kosmin and A. H. Schlesinger, assrs to Monsanto Chemical Co. Herbicidal composition comprising an oil-in-water emulsion of bis-(trichloromethyl) sulphone.

U.S.P. 2,626,862 (30.6.50; 27.1.53). P. W. Zimmerman and A. E. Hitchcock, assrs to Boyce Thompson Institute for Plant Research Inc. Plant growth is suppressed by applying undecylenic acid as a 0·3–10% aq dispersion. V. P. P.

U.S.P. 2,637,677 (10.1.51; 5.5.53). R. A. Dinerstein, assr to Standard Oil Co. Water-sol aryl mercuric salts are fungicides.

U.S.P. 2,637,705 (21.8.50; 5.5.53). L. Auer. Oil-in-water emulsion useful as an extender for pigment printing comprising 43–51·5% wt hydrocarbon solvent, 47·5–56% wt water, and 0·3–0·8% wt high visc water sol cellulose ether. The emulsions may also contain a water sol amine–aldehyde resin.

U.S.P. 2,638,411 (8.10.45; 12.5.53). W. L. Thompson, R. W. Provine, and J. V. Lawson, assrs to Mid-Continent Petroleum Corpn. Hardened paraffin wax composition comprising 75% paraffin wax, $\leqslant$1% microcrystalline wax, and 5–21% of a eutectic mixture of *ca* 67% palmitic acid, *ca* 29% stearic acid, and *ca* 4% oleic acid.

U.S.P. 2,638,431 (30.11.50; 12.5.53). J. B. Harry, assr to Union Carbide and Carbon Corpn. Fungous growths on plants are inhibited by 2-norcamphanemethanol or 2-norcamphanemethoxyethanol.

U.S.P. 2,638,459 (4.12.50; 12.5.53). J. R. Bowman, W. P. Ridenour, and J. Hollenback, assrs to Gulf Research and Development Co. Improved paraffin wax made by melting together approx equal quantities of paraffin wax and solid polyethylene, mixing until homogeneous and adding molten paraffin wax until the composition contains 0·001–7% polyethylene.

U.S.P. 2,639,259 (20.7.48; 19.5.53). R. H. Wellman and R. W. McNamee, assrs to Union Carbide and Carbon Corpn. Insecticidal composition comprising a monobutoxypolypropylene glycol, an emulsifying agent, and an insecticide.

U.S.P. 2,639,983 (Netherlands 3.5.48; 26.5.53). H. Veldstra, assr to N. V. Amsterdamsche Chininefabriek. Growth-promoting preparations for plants comprising indole acetic acid, indole butyric acid, naphthylacetic acid, dichloro-2 : 4-phenoxyacetic acid, or naphthylbutyric acid, and a dialkyl acetic acid or an alkali metal or ammonium salt or amide or ester thereof. J. M. S.

U.S.P. 2.643,962 (Sweden 17.4.50; 30.6.53). A. Johnson and Co. Sludge formation and oxidn of oil in transformers is prevented by treating the metal parts of the transformer which contact the oil with a mineral oil soln of a barium, zinc, or calcium dithiophosphate so as to effect formation of a phosphorus-containing compound on the metal parts.

U.S.P. 2,642,366 (23.3.51; 16.6.53). Marathon Corpn. Flexible cellulosic sheet material is given a smooth uniform wax coating free from irregular flow lines by applying a molten hydrocarbon wax having a surface tension *A* of 25–29 dynes/cm at 180° F and a visc of $\geqslant$100 cs at the temp of application, and passing the coated sheet through an aq cooling bath of surface tension 3–20 dynes/cm higher than *A* containing a wetting agent.

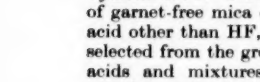
U.S.P. 2,643,973 (13.10.50; 30.6.53). Sun Oil Co. Sticking of articles comprising pet wax is prevented by applying a surface film of dist oil of visc 40–7000 SUS/100° F. V. P. P.

U.S.P. 2,655,474 (24.3.51; 13.10.53). H. G. Schutze and H. E. Cier, assrs to Standard Oil Development Co. Photochemical production of olefinic hydrocarbons. D. A. R.

DERIVED CHEMICAL PRODUCTS

799. Man-size petrochemical venture. V. B. Guthrie. *Petrol. Process.*, 1954, **9** (1), 83–5.—The Sun Oil Co of the U.S.A. have recently completed a $15 million aromatics recovery plant at their Marcus Hook refinery. This plant is one of the largest of its kind in the U.S.A., designed capacity being for 19 million gal of both benzene and toluene, and 15 million gal of xylene compounds. The plant at Marcus Hook consists of a pre-fractionator, Houdriformer, Udex recovery unit, and treating and dist facilities. The Houdriforming unit alone produces 13 million cu. ft. daily of 95–97% purity hydrogen as a by-product. J. W. H.

800. Patents. U.S.P. 2,643,770 (26.11.49; 30.6.53). American Cyanamid Co. Flotation of mica by conditioning an aq pulp of garnet-free mica ore with a mixture of a strong inorganic acid other than HF, an oiling agent, and an anionic collector selected from the green petroleum sulphonic acids, mahogany acids and mixtures thereof, and water sol salts thereof, aerating and agitating the conditioned ore at pH <6 and collecting purified mica as a froth concentrate. V. P. P.

U.S.P. 2,650,899 (G.B. 5.4.51; 1.9.53). R. N. Haward and E. T. Burrows, assrs to Petrocarbon Ltd. Polymerizable liq aromatic compounds having a $CH_2{=}C<$ group in the mol are stabilized by adding a compound of the general formula  , where R is CN or $COOC_nH_{2n+1}$ n being ≥ 4.

U.S.P. 2,650,935 (21.4.49; 1.9.53). H. R. Gamrath and W. E. Weesner, assrs to Monsanto Chemical Co. Monoalkyl dinaphthyl phosphate esters.

U.S.P. 2,651,631 (16.10.51; 8.9.53). E. Zerner and M. W. Pollock, assrs to Sun Chemical Corpn. Ethylene imine–acrylyl triazine reaction products.

U.S.P. 2,652,388 (14.5.51; 15.9.53). M. de Groote, assr to Petrolite Corpn. Oxypropylated polyamide–polycarboxylic acid reaction products.

U.S.P. 2,652,394 (27.2.50; 15.9.53). M. de Groote, assr to Petrolite Corpn. Oxyalkylation products of sucrose.

U.S.P. 2,652,407 (14.5.51; 15.9.53). M. de Groote, assr to Petrolite Corpn. Fractional esters of polyoxyalkylated furfurylamine.

U.S.P. 2,652,409 (17.10.51; 15.9.53). M. de Groote, assr to Petrolite Corpn. Polyoxyalkylated amides of *sec*-amines.

U.S.P. 2,652,418–25 (29.12.50, 5.3.51, 14.5.51; 15.9.53). M. de Groote, assr to Petrolite Corpn. These patents relate to fractional esters of polyoxyalkylated compounds. The compounds from which the fractional esters are derived include tetramethylol*cyclo*hexanol, 4 : 4′-dihydroxydiphenyldimethylmethane, 4 : 4′-dihydroxydiphenylsulphone, glyceryl ethers, and 1 : 2 : 6-hexanetriol.

U.S.P. 2,653,161 (2.12.50; 22.9.53). S. A. Ballard, R. C. Morris, and J. L. van Winkle, assrs to Shell Development Co. Phosphonates of the formula $R.PO(OCH_2CH_2CH_2SR^1)_2$, wherein R is a hydrocarbon or halohydrocarbon radical and R^1 is an alkyl group.

U.S.P. 2,653,172 (22.6.48; 22.9.53). H. L. Parry, assr to Shell Development Co. Acrolein is stabilized against autopolymerization by adding water and hydroquinone and maintaining in contact with copper.

U.S.P. 2,653,913 (21.1.50; 29.9.53). W. J. D. van Dijck and B. P. Geyer, assrs to Shell Development Co. Detergent in bar or cake form comprising a water-sol anionic synthetic detergent, paraffin wax, and an alkali metal or ammonium pectate, tannate, humate, or alginate.

U.S.P. 2,653,914 (2.11.50; 29.9.53). J. C. Elgin and E. F. Sverdrup, assrs to U.S. Rubber Co. Hexenes, heptenes, or octenes are used in reclaiming scrap vulcanized material.

U.S.P. 2,653,973 (28.7.50; 29.9.53). R. M. Hedrick, assr to Monsanto Chemical Co. Ethylenesulphonyl fluoride. J. M. S.

U.S.P. 2,655,430 (18.5.48; 13.10.53). K. F. Schiermeier, assr to Shell Development Co. Method of making calcium sulphate from refinery waste acid.

U.S.P. 2,655,525 (25.3.50; 13.10.53). F. W. Banes, W. P. FitzGerald, and J. F. Nelson, assrs to Standard Oil Development Co. Sulphated alcohol detergents from reaction product of primary monohydric alcohols with ethylene in the presence of a peroxide activator at a temp in the range 70°–225° C, a pressure in the range of 250–1500 p.s.i.g., and for a period of from 1 to 5 hr.

U.S.P. 2,655,530 (30.3.50; 13.10.53). J. A. Nevison, assr to Atlantic Refining Co. Producing an improved purified alkylated aryl sulphonate detergent. D. A. R.

Ger.P. 895,765, 24.9.53. Ambros and Bauert, assrs to BASF, Ludwigshafen (Rhein). Method for producing polyvalent alcohols.

Ger.P. 895,443, 24.9.53. Sachsse, Kosbahn, and Lehrer, assrs to BASF, Ludwigshafen (Rhein). Plant for producing C_2H_2 by incomplete combustion of hydrocarbons.

Ger.P. 895,444, 24.9.53. Kosbahn and Lehrer, assrs to BASF, Ludwigshafen (Rhein). Plant for producing C_2H_2.

Ger.P. 895,592, 24.9.53. Sachsse, Kosbahn, and Lehrer, assrs to BASF, Ludwigshafen (Rhein). Plant for producing C_2H_2 by incomplete combustion of hydrocarbons.

BrennstChemie, 1953, **34** (19–20). R. T.

MISCELLANEOUS PRODUCTS

801. Improving soap lather. Anon. *Soap, N.Y.*, May 1953, **29** (5), 95.—Lecithin, fatty alcohols glycerin mono-stearates, and other fat-like emulsifiers improve creaminess and volume of soap lather. "Tylose," "Zelluton," Rohagit, polyvinyl alcohol, and polyglycols act as foam improvers when used in 0·5–1·0% quantities.

Synthetic detergents produce rather unsatisfactory lathers, and results of mixing 2 types are unpredictable. Practical tests are only reliable method of evaluation. M. V. J.

802. Automobile polishes. W. W. Lewers. *Soap, N.Y.*, May 1953, **29** (5), 171.—The formulation of car polishes is considered in relation to ease and speed of application, durability and quality of gloss produced, and protection of finish. The author is of the opinion that a wax paste containing a mild abrasive gives the best result. M. V. J.

803. Strobane. D. L. Kent, F. O. Hazard, and F. Thompson. *Soap, N.Y.*, June 1953, **29** (6), 157.—Strobane, consisting of chlorinated terpene hydrocarbons, shows promise as a household insecticide. It can be easily formulated into liq fly sprays, livestock sprays, and aerosols. Results of Peet-Grady tests on Strobane in combinations with pyrethrins, allethrin, thanite, lethane, and piperonyl butoxide are reported. Comparative tests of aerosols containing Strobane and D.D.T. indicated that Strobane can be substituted for D.D.T. M. V. J.

804. Patents. U.S.P. 2,651,589 (25.10.49; 8.9.53). E. C. Shokal, H. A. Newey, and T. F. Bradley, assrs to Shell Development Co. Bonding composition comprising a glycidyl ether having a 1 : 2-epoxy equivalency >1 (*A*) and a reaction product of *A* with a hardening agent (*B*). *B* contains a plurality of neutralizable hydrogen atoms and has a dissociation constant in 0·01N aq soln at 20° C $>10^{-6}$.

U.S.P. 2,651,620–3 (9.12.50; 8.9.53). E. F. Hill and D. O. De Pree, assrs to Ethyl Corpn. These patents describe antioxidants for use in elastomers containing rubber-like olefin-containing hydrocarbon polymers. The antioxidants are ureas and thioureas substituted on one nitrogen atom by a hydroxyphenyl, aminophenyl, or alkylaminophenyl group, and on the other by an alkyl or aryl group.

U.S.P. 2,651,667 (15.8.51; 8.9.53). E. F. Hill and D. O. De Pree, assrs to Ethyl Corpn. Rubber stabilized against oxidn by N:N¹-bis (*p*-aminophenyl) thiourea.

U.S.P. 2,652,342 (1.7.49; 15.9.53). A. H. Gleason, assr to Standard Oil Development Co. Enamel base comprising an oily sodium copolymer of 75–85 parts butadiene-1 : 3, 25–15 parts styrene, and 0·05–0·5 parts maleic anhydride.

U.S.P. 2,652,384 (12.4.49; 15.9.53). A. F. Sayko and J. R. Briggs, assrs to Standard Oil Development Co. Thermoplastic composition consisting of a mixture of a rubbery copolymer of butadiene-1 : 3 and acrylonitrile which has been premilled at 330° F for 10–30 minutes, and a hard polystyrene, polyvinyl chloride, or copolymer of styrene and *iso*butylene or acrylonitrile.

U.S.P. 2,653,912 (20.10.50; 29.9.53). S. D. Ross and M. Nazzewskie, assrs to Sprague Electric Co. Liq dielectric composition consisting of the condensation products of radicals obtained by the pyrolysis of benzotrifluoride or a bis-trifluoromethyl benzene at a glowing filament at 300°–1500° C.

U.S.P. 2,653,919 (G.B. 28.9.49; 29.9.53). E. Hunter, assr to I.C.I. Ltd. Polyethylene dispersions are made by subjecting a mixture of molten polyethylene and water to a high rate of shear, at a temp above 115° C and at a pressure to maintain the water in the liq phase.

U.S.P. 2,653,956 (16.8.48; 29.9.53). E. G. Marhofer and J. C. Hillyer, assrs to Phillips Petroleum Co. Drying oil made by heating together a polymer of a conjugated diolefin having a visc of 20–150 cp at 77° F and an unsaturated glyceride oil. J. M. S.

U.S.P. 2,657,225 (14.2.52; 27.10.53). N. Whitman, assr to E. I. du Pont de Nemours and Co. The process for making T.E.L. by the reaction of ethyl chloride on lead monosodium alloy, which comprises carrying out such reaction in the presence of from *ca* 0·1 to *ca* 0·4% by wt of acetone and of from *ca* 0·005 to *ca* 0·06% by wt of acetylene, both based on the wt of ethyl chloride present. D. A. R.

Ger.P. 895,456, 24.9.53. Schneider, assr to Farbenfabriken Bayer AG., Leverkusen-Bayerwerk. Mineral oil emulsifier.

BrennstChemie, 1953, **34** (19–20). R. T.

CORROSION

805. An investigation of accelerated oxidation of heat resistant metals due to vanadium. F. C. Monkman and N. J. Grant. *Corrosion*, 1953, **9** (12), 460–6.—The paper describes experiments concerning the nature of accelerated oxidn caused by fuel oils containing vanadium on heat resistant alloys at high temp.

The effect of additions of some refractory metal oxides, viz. MgO, CaO, NiO, as a possible method of preventing accelerated oxidn is discussed, together with the role of Na_2SO_4 in the corrosion mechanism. Chemical analyses and X-ray diffraction studies were conducted on the oxide scale formed during the accelerated oxidn of Type 347 stainless steel in contact with V_2O_5 in an attempt to establish the oxidn mechanism.

The metal–oxide interface was found to have the highest level of oxidn and the highest vanadium concn. X-ray diffraction patterns suggested a vanadium–oxygen–metal compound, having the formula MVO_4 at this interface.

W. G. R.

806. Cathodic protection and high resistivity soil. H. C. van Nouhuys. *Corrosion*, 1953, **9** (12), 448–59.—Deals with a 25-rectifier system designed to protect a pipeline consisting of 320 miles of bare and 40 miles of coated *b*-inch product line from Port St. Joe, Florida, to Atlanta, Georgia.

A condensed description of a comparative test between magnesium anodes and rectifiers in soils between Atlanta and Chattanooga is also included. W. G. R.

807. Pipeline patrol—prevent internal corrosion. M. B. Grove. *Oil Gas J.*, 18.1.54, **52** (37), 109.—The internal protection of pipelines by the technique of applying in-place plastic linings is described. Case histories with aluminium, old steel, and new pipe are given. G. A. C.

808. Symposium on control of internal corrosion of tankers. Pt I. The nature of corrosion and its control. W. B. Jupp. *Corrosion*, 1953, **9** (11), 388–94. **Pt 2. Inhibitors in cargo.** J. V. C. Malcolmson, W. S. Quimby, C. D. Pingrey, and J. C. D. Oosterhout. *Corrosion*, 1953, **9** (11), 395–400. Cf. Abs. **745**, 1953. **Pt 3. Corrosion control in practice.** A. B. Kurz. *Corrosion*, 1953, **9** (11), 400–10. Cf. Abs. **1265**, 1953. W. G. R.

809. Carbon dioxide corrosion reduced. J. C. Albright. *Petrol. Engr*, Aug. 1953, **25** (8), C37–8.—Reduction accomplished with a system of aeration combined with the application of heat to the make-up water, with water returned to the cooling towers from the refinery hot wells. The method has been used only on water containing a corrosive quantity of CO_2, but it can be extended to include any refinery waters containing H_2S, particularly where water is at a premium.

G. H. G.

810. Engineering implications of chemical and metallurgical research at Pametrada. Anon. *Mech. World*, Feb. 1954, **134** (3415), 74.—Results of experiments carried out to overcome the corrosion and fouling problems of residual fuel burning gas turbines are given. The effects of centrifuging, reagents, and solvent extraction were studied, but the most promising results were obtained using additives to inhibit corrosion and to prevent fouling of the turbine blades. Oil-sol, water-sol, and insoluble additives have been tested. T. T.

811. Patents. U.S.P. 2,642,396 (1.5.52; 16.6.53). Texas Co. Hydrocarbon oil is made non-corrosive to metal in presence of sulphur by incorporating 0·1–60 lb/1000 brl of oil of a 2-mercaptobenzimidazole or a derivative thereof containing 1–3 C_{1-30} alkyl groups substituted in the aromatic ring.

U.S.P. 2,643,227 (21.2.50; 23.6.53). Cities Service Oil Co. Corrosion of metals exposed to corrosive oil well fluids is prevented by incorporating in the fluids the spontaneous reaction product of equimolar quantities of a polyethylene amine and an aldehyde, neutralized by a carboxylic acid.

U.S.P. 2,643,977–8 ((*a*) 29.1.51, (*b*) 24.2.51; 30.6.53). Cities Service Research and Development Co. (*a*) A mixture of one mol of diethylene triamine and one mol of an aliphatic *A* or aromatic aldehyde is heated at $>190°$ C to form an intermediate product which is similarly reacted with a further mol of *A*, the final product being added to oil well fluids as a corrosion inhibitor. In (*b*) the reaction product of triethylene tetramine or tetraethylene pentamine and an aldehyde is used. V. P. P.

U.S.P. 2,653,118 (1.2.51; 22.9.53). R. B. Seymour, assr to Atlas Mineral Products Co of Pennsylvania. Corrosion resistant surface comprising a rubber layer and a layer of polyfurfuryl alcohol resin bonded thereto by a cyclized or chlorinated rubber, the resin having a glass fibre fabric embedded in it.

U.S.P. 2,653,177 (4.6.49; 22.9.53). J. D. Kemp and H. P. Zeh, assrs to California Research Corpn. The corrosion of austenitic steel reaction vessels used in processes catalysed by phosphoric acid, is inhibited by dissolving in the acid between 0·05 and 2·5 g of copper per litre of acid.

U.S.P. 2,653,854 (17.10.49; 29.9.53). C. H. Schaar, assr to Cromwell Paper Co. Packaging material for inhibiting rusting and corrosion of metallic articles comprising paper coated with the reaction product of di*cyclo*hexylamine and caprylic acid.

U.S.P. 2,653,882 (10.3.51; 29.9.53). R. S. Treseder, assr to Shell Development Co. Fresh water containing an alkaline agent whose 0·01 molar soln has a pH $>7·8$, is used for washing the walls of tanks which have contained petroleum products, in order to clean them and inhibit corrosion. J. M. S.

ENGINES AND AUTOMOTIVE EQUIPMENT

812. Two-stroke engines for automotive use. Anon. *Gas Oil Pwr*, 1953, **48**, 314–16.—These 2-stroke loop-scavenged diesel engines operate at a max of 3150 r.p.m., giving outputs of 40–80 b.h.p. They are produced as 2 cyl and 3 cyl in line, and 4 cyl V forms; the cyl dimensions are 92 mm bore and 105 mm stroke. The cyl head carries a swirl type combustion chamber, and the Si–Al alloy pistons are fitted with 4 compression and one scraper rings. The inlet and exhaust ports are arranged so that 2 streams of scavenging air enter slightly tangentially from opposite sides and drive the exhaust gases through the radial exhaust ports.

A gear pump driven from the crankshaft passes lub oil through a filter to the front main journal, thence through the hollow crankshaft to the journals and pins. When the engine is cold and the full amount of oil cannot be filtered the excess is returned to the sump, and only filtered oil is allowed to go forward. Engine cooling water is thermostatically controlled. H. C. E.

813. Thornycroft launch for oilfield service. Anon. *Gas Oil Pwr*, 1953, **48**, 316.—The launch is powered by 3 Rolls-Royce C6SFLM 6-cyl diesel engines with cyl of bore 5⅛ inches and stroke 6 inches. Each engine develops 190 b.h.p. at 1800 r.p.m. The engines are direct-drive and are fitted with oil-operated reverse gear. A Stuart Turner diesel aux generating and pumping set comprises a 3-b.h.p. single-cyl engine coupled to a 1.5-kW dynamo and 1-inch bilge pump. The launch will operate on Lake Maracaibo, and can attain a speed of 18 knots. H. C. E.

814. New Stork two-stroke engine. Anon. *Mot. Ship*, 1953, **34** (405), 368.—A new 2-stroke, single-acting engine, built in either normally-aspirated or supercharged form, has been developed by Stork, primarily to meet demand for engines running on boiler oil. The testing of the first of these engines, which has 8 cyl of bore 750 mm and stroke 1500 mm, is reported, and the engine is described and illustrated. The output is increased by over 18% with moderate supercharging. U. M.

815. Diesel-hydraulic locomotives for Mauritius. Anon. *Gas Oil Pwr*, 1953, **48**, 327.—The power units are Paxman 12-cyl V form RPHXL pressure-charged diesel engines with cyl of bore 7 inches and stroke 7¾ inches, and give an output of 625 b.h.p. at 1250 r.p.m, corresponding to a b.m.e.p. of 110·5 p.s.i. Twin Brown–Boveri turbo-chargers are fitted, and the engines are required to operate at ambient temp of 95° F and max 92% R.H.

The hydraulic turbo transmission has 3 fluid circuits, a torque converter for starting and low speeds, and fluid couplings for the medium and high speed ranges. The method of operation is described.

The locomotives are of standard gauge, and weigh 51 tons in working order. The max tractive efforts at low and high speed are 35,800 and 23,000 lb respectively. The max speed is 45 m.p.h. H. C. E.

816. Design improvements in high-output diesel engines—[U.S.] Navy viewpoint. R. A. Coulombe. *Gas Oil Pwr*, 1953, **48**, 332.—Due to the emphasis on lightweight construction, high-output engines are subject to several difficulties. Some of these are: (*a*) piston failures by crown burning and cracking, due to inadequate cooling. Experiments have shown that for much of the time the crown underside is not bathed in oil; (*b*) High temp result in erosion and stress corrosion and cause cracks in cyl liners and water jackets, particularly when sea water-cooling is used; (*c*) wear rate of cyl liners and piston rings is great at high speeds, and associated high temp disrupt the oil film and allow metallic contact; (*d*) fuel and lub oil consumption are often high. H. C. E.

817. The Boeing gas turbine. Application of a gas turbine unit to road vehicles. H. W. Perry. *Auto Engr*, Jan. 1954, **44** (1), 41.—12 months operating experience with a gas turbine powered truck is described, and the advantages and disadvantages of a power unit of this type are discussed. A description of the Boeing Model 502 gas turbine and its performance curves are given. Model 502 is a 2-shaft unit, with independent power turbine. Max cont output is 175 b.h.p. at 2900 r.p.m. (output-shaft speed); mass flow 3·6 lb/sec and C.R. 3 : 1. 1st stage turbine inlet temp 1550° F; power turbine inlet temp 1350° F; exhaust gas temp 1150°–1200° F. It is proposed to mount 2 units side by side, one unit only being utilized normally. T. T.

818. A new marine gas turbine. Anon. *Petrol. Times*, 27.11.53, **57** (1469), 1187.—A description is given of an experimental gas turbine manufactured by Rolls-Royce under contract from the Admiralty. The engine was demonstrated at Derby. G. A. C.

819. Pressure-charged gas engines. Anon. *Gas Oil Pwr*, 1953, **48**, 317–19.—These engines are constructed in 2 ranges. 4-stroke units with cyl of 12-inch bore and 15-inch stroke have from 3 to 8 cyl and outputs of 390–1040 b.h.p., giving a b.m.e.p. of 121 p.s.i. at 500 r.p.m. 4-stroke units with cyl of 17-inch bore and 21¼-inch stroke have from 5 to 8 cyl and outputs of 1250–2000 b.h.p., giving a b.m.e.p. of 121·5 p.s.i. at 333 r.p.m. In each series the fuel consumption is 7000 B.Th.U/b.h.p.hr, with a C.R. of 10 : 1.

Gas is admitted in such a way that mixing with air does not take place except in the combustion chamber itself, and the air inlet valve opens 135° before and closes 35° after the gas valve, which is open only when the exhaust valve is closed. Full scavenging is obtained as in the normal pressure-charged engine.

Built for operation on town gas (*ca* 50% H_2), the gas is supplied to the engine at 6 p.s.i. through an intercooler. H. C. E.

820. Dynamometers. A survey of modern practice. R. H. Warring. *Auto Engr*, Oct. 1953, **43** (571), 421.—The relative merits of hydraulic, eddy-current, and all-electric dynamometers are discussed. Eddy-current machines are more flexible and more easily controlled than the hydraulic type, but for comparable duties are more expensive. Accuracy of both types is within ¼–1% of max torque. The range of the eddy-current machine is greater than that of its hydraulic counterpart, and is well suited for high speeds. The principles of operation and construction of the 3 types are given, and the requirements for test installations are laid down. T. T.

SAFETY PRECAUTIONS

821. Hydrocarbon detector with alarm. R. Monicard. *Rev. Inst. franç. Pétrole*, 1953, **8**, 555–60.—Apparatus, intended for detecting presence of vapour of wide-range jet fuel, is based on previous type of IFP detector (*cf* Abs. **2715**, 1951). Present pattern is fixed, and designed for checking atmosphere in engine test cells, etc. At gas concn below danger level ($\leqslant \frac{1}{4}$ of lower explosive limit) relay actuates safety signal, above this level such signal is extinguished, and when danger point ($\geqslant \frac{1}{4}$ lower explosive limit, equal to full scale deflection on the instrument) is attained alarm signal operates and fans are set in motion. Results of tests on detector given in detail. V. B.

822. Automatic regulation and safety of industrial plants. A. Mosic. *Nafta* (*Yugoslavia*), Nov. 1953, **4**, 352–7.—The possibility of increasing the safety degree of industrial plants is illustrated on the example of the Siemens pneumatic regulators and automatic valves, by an appropriate combination of the direction of action of the instrument and of the spring of the valve. In plants for distilling organic substances, springs of automatic valves should act, as a rule, in sense of decreasing the temperature and pressure. The practical application of this principle is illustrated on the example of a thermal naphtha reforming plant. (Author's abstract.)

MISCELLANEOUS

823. The SO_3 content of the combustion gases from an oil-fired water-tube boiler. P. F. Corbett. *J. Inst. Fuel*, Aug. 1953, **26** (151), 92.—Tests have been carried out to determine the effect of fuel, load, and CO_2 on the SO_3 content of flue gases from an oil-fired boiler. The boiler used for the experiments is an oil-fired one at Stanlow refinery, which is described. 5 oils were tested, with sulphur contents ranging from 0·75 to 3·55% over a wide range of operating conditions. The amount of SO_3 produced under each set of conditions was observed with the aid of the BCURA dew-point meter and chemical analysis. Results of tests suggest that conditions in an oil-fired boiler are such that low-temp surface corrosion can occur. Results of tests on each oil are tabulated.

Several conclusions are drawn from the statistical survey. It has not been found possible to establish a direct relationship between the SO_3 and the total sulphur in the oil. There are 17 literature refs. D. K.

824. Suppression of oil pollution of the sea. Anon. *Petrol. Times*, 27.11.53, **57** (1469), 1183.—A report is given on the international conference on oil pollution of the sea held in London, Oct. 1953.

Best efforts are to be made to ensure full practical success in preventing oil pollution by securing international agreement. The U.K. Government has taken the initiative in calling together the principal maritime nations for considering means of achieving the ends. Adequate facilities for the reception of oily residues should be ensured by statute. G. A. C.

825. The Melchett Lecture for 1953: "The domestic appliance industry and fuel usage in Great Britain." H. Hartley. *J. Inst. Fuel*, Nov. 1953, **28** (154), 234.—The design, manufacture, and use of domestic appliances for space-heating, cooking, and for water-heating are discussed. The efficiency of various appliances and the difficulties of the domestic fuel problem are especially considered. Some suggestions are made for reducing the present waste of fuel in the home. D. K.

823. Organization of industrial research. G. H. Visser. *Chim. et. Industr.*, 1953, **70**, 530–9.—After distinguishing between academic and industrial research, principles of planning latter are considered. As example, description (illustrated) is given of research lab of Royal Dutch Shell at Amsterdam, organized on a functional plan into 5 main sections (drilling and production; refining and products; chemical industry; pilot-plant; fundamental research). V. B.

827. Yugoslavia in the light of the Western European consumption of power and petroleum derivatives. V. Boranic. *Nafta (Yugoslavia)*, 1953, **4** (8), 243–9.—Statistical data are presented to show the rate of increase in the consumption of power and petroleum derivatives in the world as a whole, and particularly in Western Europe and Yugoslavia. Data are also given on the distribution of power consumed with regard to its origin, as well as on the consumption of petroleum derivatives in some Western European states, and finally on the increasing rate of petroleum import from the Near East in connexion with the growing refining capacity in Europe. Statistical data are discussed on petroleum production and refining in Yugoslavia, on the import of finished products, and on their consumption in the period from 1947 up to 1952. Using data on the rate of increase in the consumption of power and petroleum derivatives in Western Europe, the consumption in Yugoslavia has been predicted for the period up to 1960. (Author's abstract.)

BOOK REVIEWS

Synthesis of Hydrocarbons in the Gasoline Range. 1938–1953. A collection of reprints from the American Petroleum Institute Research Project for the Synthesis, Purification, and Properties of Hydrocarbons of Low Molecular Weight. Project 45, arranged by Cecil E. Boord, Director. New York: American Petroleum Institute, 1953. Pp. 261. $6.00.

This collection of papers of the API Research Project No. 45 is both of historical and theoretical interest. When the project was first initiated in 1938 there was much speculation as to its ultimate success. Such a co-operative project, involving university and industry co-operation on an hitherto unprecedented scale, was bound to give rise to doubts as well as hopes, and the intentions of the sponsors to provide pure hydrocarbons in sufficient quantity to allow complete engine testing as well as a full study of the physical properties of the synthesized hydrocarbons placed the project outside the scope of a normal university programme. The success of the project was due to two main factors. First, the zeal and enthusiasm of its Director, Cecil E. Boord, and secondly, to the great importance which the work assumed on the outbreak of war. The demand for aviation fuels of outstanding performance increased the need for synthetic hydrocarbons in such quantity that engine characteristics could be studied and fuel behaviour linked to hydrocarbon structure. Unfortunately the restrictions on publication imposed during the war years prevented the issue of the earlier work at the time of its accomplishment, but since that time full publication has been allowed. In the present book the publications have been grouped into eight main chapters. By the inclusion of an historical note, a brief but informative introduction to each chapter, and six appendices dealing with factual data on the organization and publications of the project, much of the excitement of the early days has been recaptured. Cecil E. Boord has not only collected and arranged the project papers but has also infused into the text and the brief introductory notes the spirit of enthusiasm and adventure which first launched this remarkable experiment in co-operative research and has since maintained and expanded it.

In all, thirty-nine papers are reprinted dealing with the bromo ether synthesis of olefin (8 papers), olefins from carbinols (9), syntheses by sodium in liquid ammonia (6), syntheses in the naphthenes series (6), syntheses in the aromatic series (3), and some physical constants of hydrocarbons (7). In addition, the appendices list all the papers published by APRIP-45 (52) engine studies related to the project, serial bulletins, and dissertations dealing with hydrocarbon synthesis and properties by workers associated with the Group. Each paper has been selected to show some detail of technique or new reaction in the synthesis of hydrocarbons. Thus the book constitutes a reference text to the synthesis of hydrocarbons of great value to workers in hydrocarbon chemistry. It is, however, of equal interest and value to all students of organic chemistry, for the work described constitutes a major contribution to the chemistry of hydrocarbons.

Although most of the papers have previously appeared in journals of wide circulation, such as the *Journal of the American Chemical Society*, and may therefore be familiar to most workers in the hydrocarbon field, there are a few which originally appeared in less widely circulated publications. This is particularly true of the last paper in the collection, namely one by Cecil E. Boord on "The Relation of Properties to Molecular Structure for Petroleum Hydrocarbons." This is reprinted from "Advances in Chemistry Series," Number 5 of the A.C.S. and contains a detailed analysis of the effect of chain length, chain branching, methyl groups, double bonds, and aromatic nuclei on the physical properties of hydrocarbons. Over three hundred hydrocarbons have been prepared, and the great majority

purified to a higher degree than previously recorded, so that the correlation of this data with structure represents a most important contribution to our knowledge. It will be invaluable to workers in the petroleum industry, but is also of great value to all workers concerned with studies involving variation of physical properties with structure.

The book is produced by photo-litho, and each reprint is a facsimile of the original publication. The arrangement is such as to present a chronological account of the progress of the work in each main field. The price is very reasonable when compared with the cost of other recent publications from the U.S.A., and the book should appeal to many workers in organic chemistry and the petroleum industry, not only as a record of a remarkable achievement, but also as a text-book on apparatus and methods of synthesis in the hydrocarbon field. F. M.

Instrument Technology. Vol. I. Measurement of Pressure, Level, Flow, and Temperature. E. B. Jones. London: Butterworths Scientific Publications, 1953. Pp. xii + 315. 35*s*.

Mr. Jones' book is an excellent survey of instrument technology for both the examination candidate and the working instrument man. The former, apt to over immerse himself in the academic side of his subject, and the latter, too often presented with but an empirical account of his instruments, will each benefit from the juxtaposition of principle and practice which Mr. Jones adopts.

Volume I, as the sub-title states, is concerned with the measurement of the four primary physical variables of industrial processes, pressure, level, flow, and temperature. It is intended to cover the requirements of the Intermediate Examination in Instrument Maintenance of the City and Guilds College, London, and will be followed by a second volume dealing with analysis, telemetering, and control instruments. The two volumes together will cover the ground required for the Final Examination.

The instruments dealt with in each of the four main divisions of Volume I are classified into sections and sub-sections according to the physical principles involved. These principles are completely enunciated in each such section before the presentation of clear and detailed descriptions of appropriate commercial instruments.

Regarding these detailed descriptions it might be suggested that various instruments could be better compared by a more standardized arrangement of the various general features which apply to them. Thus, sub-headings used at various times are range, accuracy, installation, calibration, maintenance, and so on. The application of a table of such headings (extended to include, say, reliability, approximate cost, and others) to groups of similar instruments, would, in the reviewer's opinion, be a valuable measure.

The large number of manufacturers' photographs and drawings used in illustration are well chosen and of a high order of clarity—an unfortunate exception being Fig 4.63, showing the image in a disappearing filament pyrometer. Here the reviewer's judgment of "disappearance" was completely at variance with the verdict of the text!

To touch on points from each of the four major divisions of the book, that on pressure measurement brings to notice, in the course of a thorough survey, a neat feature of the construction of Bellows Elements. As these are nowadays made by a one-step hydraulic process from an alloy tube sealed at one end, the pressures involved in manufacture are such as to constitute at the same time a test for imperfections in the tube alloy. Any weakness leads to the destruction of the bellows at the manufacturing stage! A further interesting innovation mentioned is the use of Teflon as a bearing material in the pressure-tight bearing of, for instance, a well type of manometer. A minor weakness in this chapter is perhaps the unduly complex choice of the servo-operated pressure mechanism (Fig 1.49) as an illustration of the use of stiff-diaphragm, low-pressure measuring elements.

Whilst dealing with level measurement (as indeed throughout the book) the student is continually reminded of the harshness of reality in the large proportion of space devoted to the measurement of levels in corrosive liquids, very hot liquids, and liquids containing solids in suspension. A comprehensive account of gas- or liquid-purge methods of dealing with such cases is given.

On flow measurement, comment might be made on some of the smaller points in a further excellent chapter.

Reynolds' number is presented here, as in very many instances, as a baldly stated formula providing no apparent logical basis for the consideration of critical values which follows. It must surely be worthwhile to introduce this quantity to students as measuring the ratio of kinetic work to work done against "internal friction" in a liquid? The significance of its magnitude is then more easily and naturally acceptable.

An omission which might be questioned in the section on the direct measurement of velocity of gases is the hot wire anemometer which has its place in the measurement of low flow rates.

A cause of some confusion occurs on p. 93, where the description of a dry gas meter refers first to its illustration on Fig 3.7 and then without prior warning, to Fig 3.8 overleaf—a diagram of the action of the meter.

Temperature measurement, the last of the four major divisions, is accorded well over one hundred pages, by far the most ample treatment. Not only does the author bring together in this one chapter a complete survey of expansion type thermometers, change of state thermometers, electrical methods of temperature measurement and radiation pyrometers but also outlines the simple electronics, thermo-electricity, measurement of the electrical variable, and laws of radiation which are fundamental to these methods. The result is a unified account of the subject which can be claimed to fulfil the author's objective of helping the reader to understand the "why" as well as the "how" of the instrument work.

Considering, once more an occasional point of detail, Table V, which is a comparison of three types of dial-thermometer—a comparison under eight headings—is a particularly useful summary.

Later in the chapter, however, a slip seems to have occurred in including the resistance-measuring Foxboro Dynalog under section 3.2.3.2 on self balancing potentiometers.

An appendix includes the mathematics pertinent to certain sections of the book together with a considerable quantity of tabulated information. An extensive bibliography is also given.

A topic for which room might have been found and which is of great interest to instrument personnel in petroleum and many forms of chemical engineering is that of the safety of electrical apparatus in explosive atmospheres. Some mention of the physical principles involved in the flame-proof enclosure of the many electrical devices described, and of design of circuits to conform to intrinsically safe standards would have been an additional attraction.

Very few printing errors were encountered in this first edition. A heading has become misplaced on p. 66, and on p. 121 the term $\sqrt{\frac{1}{w}}$ should read $\sqrt{\frac{1}{W}}$.

In conclusion, the reviewer is confident, having Volume I of Mr. Jones' book as a guide, that the publication of Volume II can be looked forward to with great interest. F. S.

Pétrole: Propriétés et Utilisations. Tome III. **Les lubrifiants et la technique du graissage.** J. Prévost. Paris: Presses Documentaires, 1954. Pp. 316. Fr. 1950.

This is a further volume (cf. *J. Inst. Petrol.*, 1953, 576A) in the series issued on behalf of the French counterpart of the W.E.A.

The book is intended to give lubricant users a good grounding concerning the main properties of lubricants and also in

lubrication principles. The former aspect is dealt with in the first half of the book and, whilst it is, of course, mainly concerned with petroleum products, other lubricating materials such as fatty oils and the restricted class of solid lubricants (*e.g.* graphite) are briefly mentioned.

The main physical and chemical characteristics of fluid lubricants, together with the usual methods of determining them, are explained. For each of these usual tests reference is made to the appropriate French, U.S., British, German, Swiss, and Belgian official methods, although in the case of the U.S. (ASTM) and British (IP) procedures the latest references are only to the respective 1947 editions. In the case of many expressions used in petroleum testing, footnotes give the English, and in some cases also German, equivalents of the French terms. A useful chapter on hydraulic fluids concludes this portion.

The second half of the work is devoted to the theory and general technique of lubrication, followed by a description of lubrication applied to industry, as exemplified by turbines, air compressors, I.C. engines, steam engines, metal cutting, etc.; suitable types of lubricant for each of these applications are indicated.

The economic aspect of lubrication is not overlooked; thus for example in the chapter, in part one, dealing with additives, the extra cost of additive oils is carefully assessed in relation to the additional benefits to be expected from their use.

In general, the treatment of the subjects covered is well above what is frequently described as the "popular" level and approximates to a post-matriculation standard. A total of 64 diagrams assists in the presentation, whilst nomographs are given for viscosity calculations and for the design of bearings.

A few inconsistencies and errors have been noticed. The statement (p. 25) that castor oil has a better viscosity–temperature relationship than mineral oils is hardly true today. The SAE classification for gear oils given on p. 64 is not quite in accordance with that given on p. 279; on p. 64 the grade described as "172" should presumably read "250." On p. 100 it is quite rightly stated that expression of acidity in terms other than mg KOH/g is to be deprecated, yet on p. 294 the acidity limit of insulating oil is given as 0·02%. The amount of silicones normally added as foam suppressors is far less than the ½% mentioned on p. 136.

Whilst the nitride method for water determination mentioned on p. 107 is, of course, applicable, it would have been preferable to refer to the more widely favoured Fischer procedure.

The comment (p. 102) that the ester value is an erroneous concept seems hardly justified; whilst this characteristic may not be widely employed, it surely has a precise chemical meaning.

The book may be recommended as providing a good outline of the subjects it covers and as fulfilling the purpose for which it has been written. V. B.

ADDITIONS TO THE LIBRARY

Fluorescence Analysis in Ultra-violet Light. J. A. Rodley and Julius Grant. London: Chapman and Hall Ltd., 1954. 4th edition. Pp. 560. 52*s.* 6*d.*

It is now 15 years since the third edition of this book was published and the new edition represents a considerable revision and enlargement of the 1939 volume. The value of the book can be judged from the fact that about one-fifth of its pages are devoted to theory and technique, the balance discussing the various fields for the application of fluorescence analysis. The increasing importance of the subject is also indicated by the book now recording nearly 3500 references to original literature.

Although the chapter on fuels and lubricants is only a small portion of the whole, there are references to petroleum products and hydrocarbons to be found in other sections.

The theory and technique section is illustrated with drawings and photographs and there are 45 plates illustrating the uses of fluorescence analysis.

British Standards.

B.S. 1428: 1953, Pt B2. Ammonia Distillation Apparatus (Markham). Microchemical Apparatus Group B: Apparatus for the Determination of Elements by other than Combustion Methods. Pp. 6. 2*s.* net, post free.

B.S. 1428: 1953, Pt E3. Micro-Centrifuge Accessories. Microchemical Apparatus Group E: General Accessory Apparatus. Pp. 6. 2*s.* net, post free.

B.S. 797: 1954. Capillary Pipettes. Pp. 13. 2*s.* 6*d.* net, post free.

B.S. 1428: 1954, Pt C1. Alkoxyl and Alkylimino Group. Determination Apparatus. Microchemical Apparatus Group C: Apparatus for the Determination of Organic Groups. Pp. 10. 2*s.* 6*d.* net, post free.

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B.S. 2080: 1954. Summary of Face-to-Face Dimensions of Flanged Ferrous Valves for the Petroleum Industry. Pp. 23. 6*s.* net, post free.

B.S. 2090: 1954. Hook Spanners, Peg Spanners, Coupling Wrenches, and the Related Slots, Holes and Horns. Pp. 29. 5*s.* net, post free.

B.S. 2091: 1954. Canister Respirators ("Gas Masks") and Dust Respirators ("Dust Masks"). Pp. 23. 4*s.* net, post free.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

828. Sedimentology and reservoirs. A. Vatan. *Rev. Inst. franç. Pétrole*, Sept. 1953, **8** (9), 475–85.—Of the 4 features necessary for an oil accumulation-source rock, reservoir rock, cap-rock, and trap, the first 3 are sedimentary, and in some cases the same is true of the fourth. On this basis the application of sedimentology to reservoir rocks is reviewed. Thus there are brief accounts of the use and application of thin sections, granulometry, studies of the form and orientation of grains, heavy minerals, light minerals, clays, and chemical investigations in oilfield exploration and exploitation. Reference is made to correlation, to the mineral suites as a guide to the stage of denudation of massifs or to palæogeographical conditions, to cements, porosity and permeability in rocks, to interactions with fluids, and to possible geophysical associations.

A plea is made for the development and co-ordination of sedimentological work in France. G. D. H.

829. Compressibility of reservoir rocks. H. N. Hall. *J. Petrol. Tech.*, Jan. 1953, **5** (1), 17–19.—Omission of rock compressibility is justified in calculations for saturated reservoirs, but not for those with undersaturated crudes. Rock compressibility is important in calculating oil in place by pressure decline when the limits of the reservoir are not known, and in studies of natural water drive performance. The effective compressibility comprises expansion of rock grains, and compaction, both factors tending to decrease porosity.

The rock samples tested were 2–3½ inches dia, and 5–6 inches long. They were in Lucite jackets, and a fixed external pressure was applied. The internal pressure was reduced in steps, and the vol of liq expelled was carefully measured. The compressibility varied with porosity, ranging from $3{\cdot}5 \times 10^{-6}$/p.s.i. at 26% to 10×10^{-6} at 2%. The compaction component accounted for *ca* 70% of the effective compressibility. Computations show that neglect of this factor may give oil contents 30–100% greater than the actual oil in place.

G. D. H.

830. Microbiological exploration of oil reservoirs. A. Luchterowa. *Nafta (Krakow)*, 1953, **9**, 217–20.—Rahn, Miyoshi, Lebedev, and Soehngen have discovered a number of bacteria capable of living on a diet of hydrocarbons. The last-named has approached this matter quantitatively. In the U.S.S.R. the Kuznetsovs, Bokova, Mohilevsky, and others have successfully applied this fact to aid the search for petroleum, and now the Geobiological section of Geoanalytical Establishment of the (Polish) Institute of Petroleum is approaching the point when this method will be used. Authoress gives details of soil sampling, selective breeding of hydrocarbon-consuming bacteria, separation of different strains, and application of such cultures to discovery of oil reservoirs. M. S.

831. Prospecting by means of radon. R. Monicard and P. Magneville. *Rev. Inst. franç. Pétrole*, Oct. 1953, **8** (10), 515–20.—The nature and origin of radon are described, and it is noted that crude oils at times contain relatively large amounts of radon, and more than would be in equilibrium with the radium in the oil. Gas associated with oil horizons is more radioactive than the oil, and the brines are more active than the gas. The radio-activity of the oil from a well declines with length of production.

The means of extracting radon from rock specimens and liq, and the methods of measuring the radio-activity of the extracted gas are described. Alternatively, soil gas can be pumped from depths of over 2 m, and after due precautions are taken the radio-activity can be assessed at points which are usually 60–450 m apart. The results of field measurements are discussed, and it is shown that at times the method will locate faults, or formation boundaries, but lateral variations in the distribution of heavy minerals may complicate the picture, and the technique cannot be considered effective for locating oil directly. G. D. H.

832. New wildcat technique. D. H. Stormont. *Oil Gas J.*, 18.1.54, **52** (37), 54.—A well has been sited to test the theory that certain bacteria thrive above oil accumulations and leave residues in the soil that can be located at the surface. The well is to be drilled near Topanga Canyon, 12 miles SE. of the Beverly field, California, and a favourable bacterial pattern has apparently been found in the vicinity. C. A. F.

833. San Ardo field—geologic case history. T. A. Baldwin. *J. Petrol. Tech.*, Jan. 1953, **5** (1), 9–10.—Tar sands near San Ardo led to several shallow dry holes between 1900 and 1920. Some of these had oil shows. Study of these results and careful mapping led to the hypothesis of an Upper Miocene shoreline; a trap might occur where the sands overlapped on granite. On a favourable surface structure the Aurignac exploratory wells found loose sands saturated with heavy viscous crude, but the wells had uncontrollable sanding. On the Lombardi structure the same shoreline yielded a few feet of oil saturation in Rosenberg No. 1. Further wells showed a sharply inclined water table, but in some production was obtained on gravel packing. Down the regional dip Orradre No. 1 found gas (Campbell pool).

The main San Ardo producing horizon is the uniform Lombardi sand in which oil, water, and gas occur not separated by the slightest shale barrier. Vertical coning of gas and water occurred for 20 ft or more. The oil is trapped at the up-dip shale edge of the sands, with the oil–water contact synclinal.

Early in 1952 the San Ardo field, enclosing the earlier discoveries, was reasonably well defined. The Aurignac sand is also productive and rests on granite. G. D. H.

834. New deep field discovered. Anon. *Oil Gas J.*, 25.1.54, **52** (38), 106.—A gas condensate field has been discovered 25 miles NW. of Houma, Louisiana. Production is from Lower Miocene sand at about 14,000 ft. Completion tests of the discovery well showed 2,500,000 cu. ft/day gas and 100 b.d. of 58·6° condensate. C. A. F.

835. Gas pays spark search for Smackover objective. J. A. Kornfeld. *Oil Gas J.*, 18.1.54, **52** (37), 152.—1 S. L. Brown, 11½ miles east of Canton, Mississippi, flowed 223 b.d. of 49·4° oil from the Smackover from 12,110 to 12,847 ft. This is the first well which has found Smackover oil production in the Eastern Gulf Province.

Further search for this production will be concentrated in areas of Smackover sand pinch-outs updip in Southern Alabama, and along major faults in the Pickens–Quitman–Gilbertown fault zone.

Economic factors have discouraged past exploration for Smackover reservoirs. C. A. F.

836. New pays stimulate Hamilton Dome production. J. A. Kornfeld. *Oil Gas J.*, 11.1.54, **52** (36), 84.—The Hamilton Dome is a local feature on the Thermopolis anticline in the southern part of the Big Horn Basin, Wyoming. Closure ranges from 2000 to 3050 ft, and there is vertical coincidence of structural axes on the various horizons.

Most of the production is from the Embar and Tensleep, and a new pay was recently found in the Ordovician Big Horn dolomite.

The field was discovered in 1918, and Madison production was found in 1948.

Cumulative recovery to Sept. 1953 was 28,862,763 brl, and average production in 1953 was 11,000 b.d. from 105 wells. Gravity varies from 14° to 26°.

Drilling and production practices are briefly described. C. A. F.

837. What are the petroleum possibilities of northeast New Mexico? P. D. Helmig. *Oil Gas J.*, 11.1.54, **52** (36), 88.—The structural features of NE. New Mexico are outlined and the geological history discussed. The oil possibilities of the region can be evaluated by considering 4 areas: the Raton basin, Sierra Grande Uplift, a zone of vulcanism and disturbance, and the Las Vegas basin.

Possibilities within the Raton Basin are good, but test wells have found only shows of oil and gas, and no appreciable folding has been discovered. A favourable area may be the east flank of the basin, where the Pennsylvanian pinches out against the Sierra Grande Uplift.

Possibilities in the Las Vegas basin are good, and a recent test has found 5000 ft of sediments, including 2060 ft of Pennsylvanian. There are many unconformities in the section, and movement may have formed traps.

Possibilities in the Sierra Grande Uplift and the zone of vulcanism are poor. C. A. F.

838. Slant drilling in Peru. Anon. *Oil Gas J.*, 18.1.54. **52** (37), 70.—An offshore well is being directionally drilled 12 miles N. of Talara in Peru. The rig is on the beach, and the test is being whip-stocked at 37½°; the first objective is at 4200 ft. C. A. F.

839. Brazil well testing. Anon. *Oil Gas J.*, 18.1.54, **52** (37), 72.—Shallow heavy oil is reported in a test in the Amazon basin *ca* 75 miles SE. of Manaos. 3 dry holes have been drilled in the Amazon river area since 1950: 2 were drilled to below 13,000 ft in the Marajo basin. C. A. F.

840. Preliminary work of the Bureau de Recherches de Pétrole on the sedimentary basins of A.O.F. P. Mauguis. *Rev. Inst. franç. Pétrole*, Jan. 1954, **9** (1), 3–17.—The sedimentary basins of A.O.F. have long been considered to be of little interest from the point of view of petroleum because of the supposed thin layer of sediments. Old work on the Ivory Coast included a shallow well near shows at Ebouenda.

The Senegal basin is almost entirely covered with sandy or lateritic deposits. Information was obtained from over 60 wells 200–600 m deep, drilled for water. The main sediments range Cretaceous to Upper Eocene in age, and are estimated to be 5000–6000 m thick in the centre of the basin on the basis of refraction work. Some Lower Palæozoic is known. Oil is known in thin low-permeability sandstones interbedded in a thick marl series in the Cretaceous. In the Cap-Vert area are NNE.–SSW. faults with throws of 100–200 m, and linked with

volcanic manifestations. Some anticlinal structures are known.

On the Ivory Coast Cretaceous and Eocene deposits occur. These are lagunar or marginal, and include shell limestones, clays, and sands. Some heavy oil has been noted in the Cretaceous. A number of old wells had small oil flows, but they were not based on adequate geological work. No folding is known.

The Dahomey basin also has Cretaceous and Eocene deposits. The oil shows in Cretaceous sands on the edge of the shield in Nigeria are not met in Dahomey.

A number of maps and sections are included, some incorporating geophysical data. G. D. H.

841. Patiya well plugged. Anon. *Oil Gas J.*, 11.1.54, **52** (36), 73.—The Patiya wildcat in the Chittagong Hill Tracts, E. Pakistan, has been abandoned as dry at 10,175 ft. Cores showed dips of about 70° below 9500 ft. Gravity exploration has been carried out in a large area of E. Bengal, and seismic surveys are being made near Sylhet.

The Sui area in W. Pakistan is said to have a natural gas potential of 100,000 cu. ft/day. C. A. F.

842. Drilling suspended. Anon. *Oil Gas J.*, 4.1.54, **52** (35), 58.—Exploration in Denmark has been suspended, and results of recent drilling are being appraised. 3 more tests may be made in Northern Jutland.

The last test was at Rodby in Lolland Island south of Copenhagen; this was dry to 11,500 ft.

6 deep wells and many shallow holes have been drilled in Denmark since active exploration began in 1947. C. A. F.

843. Palaeogeography and tectonics of the pre-Aptian Mesozoic in lower Languedoc, Causses and West Province. M. Gottis. *Rev. Inst. franç. Pétrole*, Nov. 1952, **7** (11), 395–406.—The search for oil by S.N.P.L.M. required a detailed investigation of the geology of the general Languedoc area, and a series of deep wells added to the knowledge of the subsurface formations and structures. Some of the drilling was for the Trias because of the promising features shown by outcrops of this formation. The geological history and nature of the formations are described, while the discussion of the structure is illustrated by a series of sections. The Jurassic and Cretaceous formations were investigated by drilling, but the search in these Mesozoic horizons was eventually abandoned, and attention turned to the Tertiary.

There is evidence that the structure of the deep formations differs from that of the shallow beds. Broadly the former is less complex than the latter, and the change is form occurs mainly through the plastic Triassic beds. G. D. H.

844. French test started. Anon. *Oil Gas J.*, 4.1.54, **52** (35), 59.—Parentis 1, approx 13 miles SW. of Mano I is testing a seismic feature. The Mano well, 50 miles south of Bordeaux, was suspended at approx 9000 ft.

At Lacq efforts are being made to develop production below the 2100–2400 ft productive Cretaceous, and a second deep test found 140,000–150,000 cu. ft. gas/day from 13,400 ft. C. A. F.

845. Sicily well tested. Anon. *Oil Gas J.*, 25.1.54, **52** (38), 116.—Production tests are being made on a wildcat near Ragusa, SE. Sicily, where approx 29° oil has been found at about 6200 ft. A further test in the area is planned.

Italian and foreign companies are currently carrying out exploration on the island. C. A. F.

846. Grecian drilling under way. Anon. *Oil Gas J.*, 4.1.54, **52** (35), 59.—A well is being drilled in the Peloponnesus of Southern Greece, and exploration is to be carried out in the north-eastern part of the country. Surface seeps are known, but past exploration has not been successful; the western part of the Peloponnesus is said to have the best prospects. C. A. F.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

847. Twenty years of advancements in geophysical techniques. H. Hoover. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 77–80.—The direct cost of world-wide geophysical operations in 1952 is placed at $400,000,000. Geophysics has been a major contribution to oil discoveries in recent years. In 1933 the torsion balance was being displaced by the gravity meter, which was quicker and cheaper. Refraction shooting passed its peak in 1931. At the beginning of 1932 10 reflection crews were operating in the Gulf Coast area. There was geographical expansion of the geophysical work. Refraction work was very successful in Iran. Later reflection work spread to the Near and Far East. There was development of techniques, instruments, and means of transportation to deal with new problems. Now instruments employ as many as 50 traces, compared with 4 or 6 in 1933. The airborne magnetometer was developed for survey work in 1944, and is valuable for reconnaissance in suitably sized areas. Electronic surveying techniques are of great value in aerial and offshore surveys.

In 1940 Weatherby gave figures from which it can be inferred that geophysical costs of oil finding were 5 c/brl; in 1952 the figure was 12 c/brl, according to Eckhardt. It is difficult, however, to allocate discoveries and costs without doubt. In recent years the geologist and geophysicist have come closer together, and combined training is common. G. D. H.

848. A hydrocarbon detector with a danger signal. R. Monicard. *Rev. Inst. franç. Pétrole*, Dec. 1953, **8** (12), 555–60.—The apparatus is fixed and intended to control the atmosphere at a given place. Any oxidn or combustion due to the presence of hydrocarbon gases changes the current through an electrically heated filament, and this change can be used to operate signal lights, sound alarms, or even ventilators by means of suitable relays. One device planned is such that at low conc of J.P.4 (a fuel reactor) a green light shows; at intermediate conc the light is extinguished, and at a value of a half to two-thirds the lower limit of inflammability a red light shows, a noise sounds, and ventilators are opened.

Experiments in the development of the detector are described. Critical readings of the detector depend on the atmospheric temp. A prototype has been run continuously for 40 days. The turbine which causes the air to flow over the filament failed for one day, and at the end of the run the filaments were in good condition. Means for checking the drift of the zero can be applied. G. D. H.

849. Patents. U.S.P. 2,654,874 (14.6.51; 6.10.53). F. Press, assr to Socony-Vacuum Oil Co. A seismic exploration method which comprises releasing acoustical energy at a sub-surface sending station for generating seismic waves, which are reflected back to the surface from sub-surface interfaces.

U.S.P. 2,657,373 (6.9.49; 27.10.53). R. G. Piety, assr to Phillips Petroleum Co. Apparatus for seismic exploration.

U.S.P. 2,657,374 (2.11.49; 27.10.53). T. Bardeen, assr to Gulf Research and Development Co. Suspension system for seismograph detectors.

U.S.P. 2,657,380 (9.1.50; 27.10.53). C. A. Donaldson. Underground prospecting system. D. A. R.

U.S.P. 2,658,578 (5.10.48; 10.11.53). C. W. Oliphant. Seismic prospecting.

U.S.P. 2,658,579 (17.8.49; 10.11.53). F. Rieber, assr to Geovision Inc. Apparatus for the display of geophysical data recorded as a plurality of parallel phonographically reproducible tracks of variable light reactive value.

U.S.P. 2,659,046 (19.10.48; 10.11.53). J. J. Arps. Geophysical exploration using radioactive material.

U.S.P. 2,659,064 (19.8.49; 10.11.53). R. G. Piety, assr to Phillips Petroleum Co. Rotational seismometer.

U.S.P. 2,659,065 (11.8.50; 10.11.53). R. L. Cordell, assr to Stanolind Oil and Gas Co. Seismometer.

U.S.P. 2,659,859 (5.4.46; 17.11.53). C. A. Heiland. Aeromagnetic prospecting by moving an earth inductor (A) with an airplane in flight, continuously actuating (A) to move its axis into the plane of the magnetic meridian, rotating (A) and continuously compensating the action upon (A) of the magnetic field under investigation by an auxiliary magnetic field of equal magnitude and opposite direction responsive to voltages produced in A.

U.S.P. 2,659,882 (3.12.47; 17.11.53). W. M. Barrett. Prospecting by transmitting from a sending point (A) electric energy along the earth's surface to a receiving point (B) in a manner such as to refract some of the energy into the earth and downward along multiple parallel paths on to a reflector of electric energy lying beneath the surface and thence to B, and detecting at B the energy that travelled along the surface from A to B and the energy that reached B via the reflector.

U.S.P. 2,660,062 (17.3.50; 24.11.53). E. W. Frowe, assr to Robert H. Ray Co. Gravimeter apparatus for geophysical prospecting.

U.S.P. 2,660,703 (26.4.52; 24.11.53). R. J. Herbold, assr to Lafayette M. Hughes. Electrical method of geophysical exploration. J. M. S.

DRILLING

850. Summary of progress in the drilling industry. J. H. Abernathy. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 21–4.—During the past 20 years there has been a switch from almost complete reliance on steam rigs to almost universal use of power rigs. Modern steam rigs are much more transportable than before. Their disadvantages are high water consumption and use of much fuel. Recently in power rigs fluid couplings, torque convertors, and electro-magnetic couplings have been widely employed. Rigging up, dismantling, and moving have been greatly simplified.

Bits have been improved. A jet bit with sufficient pump capacity can penetrate soft beds rapidly. 15 to 20 drill collars may be used immediately above the bit to give weight. Great attention is paid to the mud. There have been great advances in the training and use of manpower. Pay may be $550 per month; some contractors pay pensions, insurance, etc.

Since 1945 drilling speed has increased by 50%, but the cost per foot is less than in 1938. It is likely that more horsepower will be used per ft depth rating in the future. A highly portable slim-hole rig is needed which will explore to 10,000–15,000 ft. G. D. H.

851. Wells are cheaper by the half dozen. W. P. Sterne. *Oil Gas J.*, 18.1.54, **52** (37), 82.—A rig designed for multiple drilling which is being used offshore in the Gulf of Mexico is described in detail. By means of a movable crown block and guide-sheave assembly, it can drill up to 6 wells without being moved, enabling 6 holes to be drilled in 2 rows 6 ft apart from the same location without affecting the spooling on the drawworks drum. Wells drilled within the rows are spaced 7½ ft apart.

Power for the movable rotary table is applied through an adjustable chain drive. C. A. F.

852. Evolution of drilling in the search for oil. M. G. Lugol. *Bull. Ass. franç. Tech. Pétrole*, Nov. 1952, **30**, 3–40.—The evolution of drilling methods and equipment is described. Tables and graphs provide data on the rigs in use and depths drilled in recent years in France and the U.S.A. Drilling rates are given for various categories of rigs in France, and depth records are listed for the U.S.A. Expenditure on drilling and other operations is given for France, together with the cost per metre in recent years. G. D. H.

853. Directional drilling to-day. G. Jackson. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 27–31.—At first directional drilling was used to get at otherwise inaccessible points, but now in many cases it is used as the most economic procedure. Surveying instruments have been improved. The offshore problem is prominent. In the first 6 months of 1953, over 20% of all wells drilled in California were directional. In one well the vertical depth was 4240 ft, and the horizontal deflection 10,244 ft, average penetration rate was 235 ft/day. Directional drilling has been successful with gas as the circulating medium. The use of non-magnetic drill collars permits surveying without pulling out. G. D. H.

854. Measurement and recording of the rate of advance of the bit. R. Monicard. *Rev. Inst. franç, Pétrole*, Nov. 1953, **8** (11), 527–44.—A knowledge of the rate of advance of the bit provides information of the rock properties, and rates can be linked with the cuttings recovered. The factors affecting drilling speed are briefly reviewed, and the principles used in the Geolograph, Log-o-graph, Martin Decker, and Richards instruments are briefly described. Examples of the various records are given. None of these pieces of equipment records the instantaneous rate of advance.

A new electrical device is described which gives a record of the instantaneous rate of advance, *i.e.* it measures the unwinding of the cable as permitted by the driller according to his judgment based on Martin Decker weight indications. The theory, construction, and use of the device are described. Trials have been made and examples of the records are excluded. G. D. H.

855. Problem of drilling progress in the light of examination by the (Polish) I.P. Z. Turkowski. *Bull. (Polish) Inst. Petrol.*, 1953, **3**, 7–8 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—Lack of experience as to the optimal conditions for rotary drilling causes slow progress. Investigations with bits which work using 4 rollers have been carried out on rollers of 308 calibre, changing one variable at a time show that pressure = 0·37 ton/inch dia, gives the results of 0·28 m/hr for 40 r.p.m. and 0·56 m/hr for 120 r.p.m. at 18·2 l/min of mud. Between 0·37 and 0·7 ton/inch dia progress is 0·37 to 0·7 m/hr at 40 to 120 r.p.m. and 18·2 l/min of mud. Between 0·7 and 1·0 ton/inch dia, progress is 1·0 (approx) to 1·8 m/hr in otherwise identical conditions. During forced drilling, progress rose threefold and wear fell to a third. Experiments were carried out in the hard formations of Krosno district. M. S.

856. Chemical correlation of aqueous levels in the " G-K-L " (Gorlice–Kryg–Kipinki) fold. W. Chajec. *Bull. (Polish) Inst. Petrol.*, 1953, **3**, 5 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—Since during drilling in this area brines are encountered several times, only chemical methods can be used for correlation. Characteristic ion ratios show existence of 2 separate sources: one from Ciezkowice sandstone (80% salts, 20% alkalis in residues), the other from Czarnorzec sandstone (47% salts, 50% alkalis in residues). The former changes its composition slightly from east to west. M. S.

857. Power management in the oilfield (activities). J. Borowski. *Nafta* (*Krakow*), 1953, **9**, 223–5.—Power for drilling and pumping as well as heating in the Polish oilfields used to come from steam raised by combustion of gas. This has never been efficient and always costly in valuable raw material. I.C. engines and electricity have since supplanted steam engines, and, as well as economical management of gas supplies, they have brought great savings. Percentage changes in power consumption are listed and followed by suggestions aimed at further economy. M. S.

858. Science and technique in the Soviet Union—small diameter drilling using cast iron shots. R. Piatkiewicz. *Nafta* (*Krakow*), 1953, **9**, 13–14, 74–6, 103–4, 129–30, 153–4, 225–6.—Cast iron shots are used for small dia drilling in hard rock. Generally speaking depths of 1 km can be reached, directional drilling at up to 30° from vertical is possible, and dia 75–200 mm are most common. Cast iron shots break into angular fragments which, pressed down by simple bit, cut into rock feeding a core into the drill pipe. Bits are made of fairly soft tensile steel: hardness 80–85 Rockwell, 0·4–0·5% C. Cast iron shots embed themselves in it, and in due course it wears

out. A space is usually cut out in the rim to allow continuous feed of shots. Bits should be 500–1000 mm long. Above the bit is the coring pipe, and above that the feeder (hopper). The shots contain 0·5–0·8% Mn, 2·25–75% Si, 0·7–1·2% P, and not more than 0·04% S. Their hardness (Vickers diamond pyramid) is not less than 850 at 5 kg. The various shapes of shots are separated before delivery. Only spherical shots are suitable for continuous feed. Their dia may vary from 1·5 to 5 mm, but each batch must be identical. 3 mm dia is best. If there is not enough shot the dia of hole becomes smaller, and further addition of shot may jam the pipe and bit. Alternative method is to raise the bit 0·3–0·5 m and to feed 3–6 kg of shots and then 0·5–1·5 kg to every one for 3 hr. For reasons of safety new additions must be made when drilling progress just begins to fall off. To avoid jamming, shots of ever decreasing dia may be successively added. Instances of progress using different methods are given. Supply of drilling mud must be such as to perform the following actions: (1) raise most of the shots off the well bottom to allow the bit to reach down; (2) remove powdered shots; (3) cool the bit. For this reason rate of delivery of mud must vary throughout the drilling, *e.g.* for a 130 mm dia bit 20–26 litres/minute are required at the start and 10–13 litres/minute at the finish of drilling. For continuous supply of shots a steady rate of 1·5–2·0 litres/minute/cm of bit dia is required. At the end of each operation when core is extracted a good wash through with 60–100 litres/minute of mud for 30 minutes is necessary, unless this would break up the rock.

Rate of progress depends on pressure applied, and it reaches max at 20–25 kg/cm² of actual bit area irrespective of formation. Rate of progress is also directly related to revs/minute. Best circumferential velocity is 0·8–1·2 m/sec, which corresponds to 220–120 r.p.m. for bits of O.D. 65–130 mm and I.D. 50–105 mm.

After each section has been drilled bit is raised 5 cm, hole cleaned, core locked and broken off, whilst crew prepare for extracting the string. M. S.

859. Twenty years of oil well cementing. W. D. Owsley. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 17–18.—Squeeze cementing began in 1932 in the Texas Gulf Coast, and now equipment is available which can be used with operating pressures up to 10,000 p.s.i. Retarders and additives have helped. Bottom and top plugs have been greatly improved, preventing soft cement. Mud cakes were found to cause unsatisfactory cement jobs, and scratchers have been used on casing to remove wall cakes. Caliper surveys make it possible to use the correct volumes, while temp surveys serve as a check.

Much more is known about the properties of cements under high pressure and temp. In the U.S.A. most oil well cementing is now done with bulk cement, mechanically handled. Dry blending of additives is possible. G. D. H.

860. Cements for closing subterranean waters. H. Gorka. *Bull.* (*Polish*) *Inst. Petrol.*, 1953, **3**, 7 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—A brief summary of the work of (Polish) I.P. on the subject of properties of cements required for above purpose and a report on 3 grades suitable. M. S.

861. Investigations of gas producing drill holes. Anon. *Bull.* (*Polish*) *Inst. Petrol.*, 1953, **3**, 8 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—To find out if condensate occurs at the bottom of gas producing wells, sampling was carried out in 2 gas fields at various stages of production. One field showed fresh water and condensate of sp. gr. = 0·769–0·774, in another there was no condensate. M. S.

862. Regeneration of muds. Anon. *Bull.* (*Polish*) *Inst. Petrol.*, 1953, **3**, 5–6 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—Muds pick up Cl^- Ca^{2+} and OH^- during circulation, and their properties are affected. A method is given for regeneration of each property affected. M. S.

863. Means and methods of improvement of the properties of drilling muds. J. Osiecki. *Nafta* (*Krakow*), 1953, **9**, 139–41.—Author gives methods of raising sp. gr. of muds, improving their filtration, and lowering their visc. In the first group barytes and hæmatytes are suggested. In the second bentonites, Na salts of humic acids from lignite or peat, Na_2Co_3, and carbomethoxy-cellulose. In the third are lignosulphonic acid salts from alkali washing of by-products of cellulose manufacture, phosphates, tannins, and humic acids with Na_2CO_3. It must not be forgotten that addition of water also lowers visc. M. S.

864. The preparation of bleaching clays. J. Kulcar. *Nafta* (*Yugoslavia*), Sept. 1953, **4**, 285–98.—5 samples of bentonitic clays from Bednja, Croatia have been examined as bleaching clays after activation with sulphuric acid. Optimum activity has been obtained with 20% H_2SO_4, digestion time 6–8 hr, and acid–clay ratio 0·6. The digestion was carried out at the boiling point of the clay suspension. The investigation of the clay samples included chemical and dispersion analysis, sand content, swelling power, benzidine-test, base exchange, and X-ray examinations. The decolorizing power was tested on a lub oil fraction, comparing the action of the clay samples with a German bleaching clay (Tonsil Optimum) on a Dubosqu-type colorimeter. The greatest decolorizing power was 82%, as compared with the German clay. Activation and washing of the clays with hard water has shown that the effect of the ions present in the water on the activity of the clay samples was negligible. Experiments using spent acid from previous tests showed that activation under such conditions is possible, when the concentration of sulphuric acid in the spent acid is brought up to the optimum 20% with fresh acid.

(Author's abstract.)

865. An evaporation method for measuring the resistivity–water saturation characteristics of cores. J. Birks. *J. Inst. Petrol.*, 1954, **40**, 14–17.—A reproducible evaporation method using aq calcium sulphate soln has been developed for measuring the resistivity–water saturation characteristics of both sandstone and limestone core samples. A. R. W. B.

866. Patents. U.S.P. 2,654,435 (12.9.52; 6.10.53). J. G. Oliver, assr to E. H. Rehder, H. H. Briggs, and J. E. McMillan. A device for centralizing pipe adapted to be lowered into a well.

U.S.P. 2,654,436 (16.7.51; 6.10.53). W. C. Carlisle and J. H. McCarvell, assrs to Macco Oil Tool Co. A method of preventing corrosion in a well by introducing a column of a corrosion-inhibiting chemical into an annular passage between a well tubing and a well casing, continuing the introducing until the column is of a length substantially equal to the length of the well tubing, thereafter pumping into the column an additional quantity of chemical, and forcing the additional quantity into the well tubing near the bottom of the column of chemical against the pressure in the well tubing.

U.S.P. 2,654,572 (15.10.49; 6.10.53). A. Arutunoff. Submersible drilling apparatus.

U.S.P. 2,654,573 (2.2.48; 6.10.53). G. Annesley, assr to H. E. Annesley. Detachable rock drill bit.

U.S.P. 2,654,574 (9.1.50; 6.10.53). A. W. Kammerer. Expansible rotary drill bit.

U.S.P. 2,654,575 (19.1.50; 6.10.53). A. W. Kammerer. Tandem expansible rotary drill bit.

U.S.P. 2,654,576 (18.8.50; 6.10.53). A. W. Kammerer. Expansible rotary drill bit.

U.S.P. 2,654,577 (26.9.47; 6.10.53). W. G. Green, assr to Engineering Laboratories, Inc. Drill bit.

U.S.P. 2,654,578 (28.11.49; 6.10.53). W. L. Pearce. Earth formation disintegrating drill.

U.S.P. 2,654,627 (11.7.49; 6.10.53). D. Story. A device for recovering articles of magnetizable material, *e.g.* rock bits from an oil well.

U.S.P. 2,654,960 (7.7.52; 13.10.54). J. C. Hewitt. Apparatus for operation within a super-atmospheric temperature zone in a well.

U.S.P. 2,655,038 (4.6.49; 13.10.53). D. Barton, assr to Stanolind Oil and Gas Co. Well formation packer assembly for measuring gas–oil ratios.

U.S.P. 2,655,113 (3.11.49; 13.10.53). W. F. Ward. Oil well equipment comprising a combined rod guide and liq supporting member for use on a sucker rod within a well casing.

U.S.P. 2,655,216 (23.4.48; 13.10.53). R. C. Baker and B. L. Austin, assrs to Baker Oil Tools Inc. Positive shutoff ported casing apparatus.

U.S.P. 2,655,217 (4.9.51; 13.10.53). E. W. Bagnell, assr to Johnston Testers Inc. An oil well flow regulator device.

U.S.P. 2,655,218 (3.6.49; 13.10.53). R. L. Crain, assr to Gray Tool Co. Equipment for treating wells.

U.S.P. 2,655,344 (6.11.50; 13.10.53). H. W. McDonald, assr to McDonald Hydraulic Drilling Co. Rotary bit operating mechanism.

U.S.P. 2,655,475 (26.9.49; 13.10.53). P. W. Fischer and R. A. Rogers, assrs to Union Oil Co of California. A drilling fluid comprising water, a finely divided solid suspended therein, a soap of an alkali metal, ammonium or amine salt of an oil-sol mineral oil sulphonic acid, and a water dispersible natural gum.

U.S.P. 2,655,633 (7.5.51; 13.10.53). B. S. Minor and F. J. Lopker, assrs to Regan Forge and Engineering Co. Apparatus for measuring pipe in or out of holes by electronic means.

U.S.P. 2,655,993 (22.1.48; 20.10.53). L. Spencer, assr to T. C. Bannon and J. D. Chesnut. A gun perforator adapted to be lowered on a cable into a well casing and comprising a series of gun units.

U.S.P. 2,656,613 (17.4.48; 27.10.53). R. W. Goble, assr to Eastman Oil Well Survey Co. Well caliper apparatus for measuring an earth bore which may have relatively wide variations in dia.

U.S.P. 2,656,616 (29.6.50; 27.10.53). J. C. Hewitt. An inclinable well surveying instrument comprising an elongated case containing a compass device operable to indicate the direction of the instrument inclination, a compass illumination source, and a recorder acting to make successive photographic records of the compass device positions.

U.S.P. 2,656,891 (2.3.48; 27.10.53). L. W. Toelke. Apparatus for plugging wells.

U.S.P. 2,657,011 (1.4.50; 28.10.53). J. C. Slonneger, assr to Continental Supply Co. Control apparatus for cable drums of hoists and winches.

U.S.P. 2,657,013 (12.3.49; 27.10.53). E. F. Brady, assr to Eastman Oil Well Survey Co. Core orienting apparatus and method.

U.S.P. 2,657,015 (16.3.50; 27.10.53). O. Colquitt, assr to Patents Inc. Means for circulating mud in rotary well drilling rigs.

U.S.P. 2,657,016 (20.1.50; 27.10.53). D. B. Grable. Fluid circulation head for drill strings. D. A. R.

U.S.P. 2,657,751 (20.2.50; 3.11.53). T. M. Johnston, assr to Johnston Testers Inc. Open hole packer of the sleeve type.

U.S.P. 2,657,752 (31.3.49; 3.11.53). H. W. Ballew and J. R. Ballew. Magnetic fishing tool.

U.S.P. 2,657,907 (24.7.50; 3.11.53). J. F. Cochran, J. I. Middleton, and N. D. Jaques. Insert for drilling strings.

U.S.P. 2,657,908 (3.9.49; 3.11.53). G. E. Failing, assr to George E. Failing Supply Co. Breakout table for drilling rigs.

U.S.P. 2,657,909 (11.3.49; 3.11.53). W. J. Bielstein, assr to Standard Oil Development Co. Wear indicator for drill bits.

U.S.P. 2,657,956 (15.8.49; 3.11.53). J. E. Hall, assr in part to Parker Industrial Products Inc. Drill pipe protector.

U.S.P. 2,658,035 (16.11.49; 3.11.53). H. E. Bode, assr to National Lead Co. Aq well-drilling fluid containing an insoluble amylopectin complex of barium, aluminium, or zinc in amount sufficient to attain a low water-loss.

U.S.P. 2,658,284 (3.1.49; 10.11.53). J. J. Arps. Arrangement for measuring the inclination and direction of boreholes at a given depth.

U.S.P. 2,658,459 (17.5.48; 10.11.53). J. S. Page, assr to Page Oil Tools Inc. Anchor for well equipment.

U.S.P. 2,658,724 (23.5.49; 10.11.53). J. J. Arps. System for warning of an excessive rise in temp during rotary drilling.

U.S.P. 2,658,725 (31.10.47; 10.11.53). J. J. Arps. Signal transmission system for use in logging drill hole formations.

U.S.P. 2,658,726 (8.11.48; 10.11.53). J. C. Stokes, assr to Reed Roller Bit Co. Core taking apparatus.

U.S.P. 2,659,014 (5.7.51; 10.11.53). S. A. Scherbatskoy, assr to Perforating Guns Atlas Corpn. Radio-activity well logging system.

U.S.P. 2,659,160 (14.11.47; 17.11.53). G. A. Smith, assr to Sperry-Sun Well Surveying Co. Well surveying instrument.

U.S.P. 2,659,438 (16.8.46; 17.11.53). S. B. Schnitter, assr to L. L. Rector. Apparatus for cementing pipe in a well bore.

U.S.P. 2,659,439 (27.12.49; 17.11.53). R. C. Baker, assr to Baker Oil Tools Inc. Centering device for a well conduit string.

U.S.P. 2,659,440 (4.12.50; 17.11.53). D. W. Osmun. Casing repair tool.

U.S.P. 2,659,441 (12.1.51; 17.11.53). S. R. Knapp. Hydraulically actuated fishing tool for reclaiming broken drill parts and other debris from the bottom of a well bore.

U.S.P. 2,659,442 (1.6.51; 17.11.53). W. N. Sutliff. Bailer for oil well bores.

U.S.P. 2,659,574 (9.4.52; 17.11.53). R. R. Crookston, assr to Standard Oil Development Co. Live line load wt indicator assembly.

U.S.P. 2,659,575 (20.10.52; 17.11.53). A. L. Seljos, assr to Standard Oil Development Co. Live line load wt indicator assembly.

U.S.P. 2,569,576 (19.12.50; 17.11.53). D. M. Linney, assr to Bowen Co of Texas. Combination jar and equalizer.

U.S.P. 2,659,577 (23.10.50; 17.11.53). G. R. Watson. Rock drill bit.

U.S.P. 2,660,240 (22.3.50; 24.11.53). M. Ringler. Cutting device for cutting pipes used in drilling wells.

U.S.P. 2,660,247 (13.9.49; 24.11.53). C. H. Sweet, assr to Sweet Oil Well Equipment Inc. Retrievable well packer.

U.S.P. 2,660,248 (17.12.51; 24.11.53). C. C. Brown. Well head apparatus.

U.S.P. 2,660,250 (28.9.51; 24.11.53). L. L. Gage and C. L. Nelson. Means for removing foreign matter from drill holes.

U.S.P. 2,660,402 (19.12.49; 24.11.53). V. J. Devine and L. V. Devine. Core drilling apparatus.

U.S.P. 2,660,404 (10.4.48; 24.11.53). J. H. Meier, assr to Bucyrus-Erie Co. Control for pneumatic cable-tool drills.

U.S.P. 2,660,468 (28.7.49; 24.11.53). H. Cook. Deep well fishing tool.

U.S.P. 2,660,561 (28.8.50; 24.11.53). T. E. Watkins, assr to Socony-Vacuum Oil Co. Water loss from aq drilling fluids is reduced by adding to such fluids karaya gum which has been previously heated to 90°–100° C for a time not less than that given by the expression $T = 28 - .2t$, where T is the time in hr and t is the temp in °C. J. M. S.

PRODUCTION

867. Petroleum production equipment in twenty years of development. C. E. Reistle. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 45–8.—Deeper wells have called for equipment capable of standing higher pressures and temp. Alloys, treatment, and design have met this need. To prevent freezing in reducing high pressures at the surface in producing condensate wells, the well fluids have been heated in a water bath, and water absorbers have also been used.

Well servicing costs have been reduced by using self-propelled telescoping masts on production hoists. Sub-surface hydraulic pumping has proved economical in some wells by using a unit which can be carried out of the hole by the fluid for servicing. Gas-lift valves are being developed for wire-line installation and servicing. Dual zone pumps are in the incipient stages of development.

Corrosion is being combated by cathodic protection, organic inhibitors, and flow-line insulators. G. D. H.

868. Equipment in production laboratories. A. Houpert, P. Albert, and R. Molinero. *Rev. Inst. franç. Pétrole*, Sept. 1953, **8** (9), 466–74.—The equipment used in P.V.T. studies in various laboratories is briefly described, and there is a detailed description of a windowed cell constructed at the Institute Français du Pétrole for 2-phase studies when the vol of liq is small. The mode of use of this cell is outlined.

The main methods of mounting rock specimens for permeability measurements are given—perforated rubber stopper, rubber pressurized envelope, and plastic coatings. The conditions used by various experiments in the U.S.A. for applying plastic coatings are set out, and the use of corite in France is described. G. D. H.

869. Centre-to-edge line drives up recovery. J. A. Kornfeld. *Oil Gas J.*, 4.1.54, **52** (35), 87.—Centre-to-edge flooding technique has been applied to the Salt Creek field at the northern end of the Scurry reef trend, W. Texas. Instead of using the conventional edge line of wells, input wells are sited along the major axis of the reef and the entire Canyon section is exposed to injection, oil being displaced from the centre of each flank.

Excellent pressure communication is indicated from pressure surveys, and reservoir behaviour closely follows that predicted from potentiometric model experiments. No by-passing or channelling, has been indicated, and reservoir pressure decline has been halted. C. A. F.

870. Filtered ocean water used to flood wells in California's Wilmington field. D. H. Stormont. *Oil Gas J.*, 4.1.54, **52** (35), 68.—A trial water-flood project in a fault block of the Long Beach Harbour area of the Wilmington field is described in some detail.

Tests of the sand showed a residual oil saturation of approx 20% with an existing saturation of over 65%. It is estimated that 13–26% of total oil in place might be recovered by flooding.

Ocean water is used for injecting. C. A. F.

871. Recent laboratory investigations of water flooding in California. N. Johnston and N. van Wingen. *J. Petrol. Tech.*, Aug. 1953, **5** (8), AIMME Tech. Paper No. 3640, 219–24.—Laboratory flood plot testing of California oil sands has developed considerably, but there is no field flood sufficiently advanced to provide extensive experience factors. In tests encouraging recoveries were obtained with oils of visc up to 1800 cp. Oil banks were frequently formed, and water–oil ratios were of the same order of magnitude as for comparable tests on Mid-Continent and Eastern sands. Considerable amounts of oil were recovered by viscous drag. Recoveries were higher when more oil was initially present, and bank formation was more likely. Residual oil saturation was greater when more oil was initially present. Initial water saturations, above which oil recovery was negligible, were surprisingly high in the tests. Percentage oil recovery from flood pot tests cannot be predicted from ordinary core analysis data. Water pre-treatment was found to be important in successful flood pot tests.

Tables summarize flood pot data, and give relative permeabilities to oil and water *vs* saturation. G. D. H.

872. Development of techniques in reserve estimation. D. L. Katz. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 81–3.—In the early thirties there was a transition from uncontrolled to controlled production, and there came into being the reservoir engineer who combined geological and engineering techniques and knowledge in treating reservoirs. Before proration reserves were reasonably estimated from linear production decline curves (semi-log), from pore volumes found by well data, and, in the case of gas, from pressure decline. Decline curves have now faded from the scene, and material balance gives oil in place. The presence of interstitial water is recognized, and relative permeability is important in estimating recovery by different techniques. Cores are now analysed, and electric logs taken in every well. The physical properties of reservoir fluids under subsurface conditions have been studied. Shrinkage may be extensive. The producing mechanism importantly affects the oil recovery, and producing rates must be investigated.

In gas fields with water drive, the advancing water may trap at least 10% of the gas.

Computing machines have been adapted to analyse reservoir behaviour under a series of postulated conditions.

G. D. H.

873. Decline curves in reserve estimation. T. J. Nowak. *J. Petrol. Tech.*, Aug. 1953, **5** (8), 15.—Production decline curve methods assume that past history is a guide to future behaviour. This may be true for wells produced without curtailment. Constant percentage decline is revealed by a linear plot of log rate against time. Where the previous plot gives curvature, a log–log plot, with suitable shifting, may give a straight line which eases extrapolation (the decline curve is hyperbolic).

Sometimes flush production is associated with variable decline, and settled production with constant decline. Even for variable decline there are advantages in a semi-log plot, because it permits estimation of the trend of the changes.

G. D. H.

874. Some features of growth in fluid injection techniques. W. L. Horner and A. E. Sweeney. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 51–6.—*Ca* 20% of U.S. oil production comes from fields which have fluid injection, including pressure regulation and water flooding. The first gas injection project is attributed to Dinsmore in Venango Co, Pennsylvania, in 1888. The first water injection was at Bolivar and Richburg in New York, *ca* 1912. Gas injection pressure regulation began at Sugarland, Texas, in 1930, and water injection pressure regulation by salt-water disposal was introduced at East Texas in 1938. 20 years ago predictions were based on pilot tests, but now they depend on calculation. Production from water injection was 12,000,000 brl in 1932, and 236,000,000 brl in 1952. In 1952 there were *ca* 40 water injection projects in limestone reservoirs in the U.S.A. (some 60% of U.S. production is from carbonate reservoirs). Since 1932 annual production from gas injection projects (not recycling) has risen from 23,000,000 to 160,000,000 brl. There are numerous cases of major gas injection projects being converted towards water injection.

Some details are given of the extensive preliminary work carried out on the Sacroc Unit (Kelly–Snyder area, Texas), comprising 49,000 acres and 1239 oil wells, before starting fluid injection. Line drive water injection is recommended, and the pattern was analysed in potentiometric models.

G. D. H.

875. Milestones in two decades of reservoir engineering. L. E. Elkins and S. J. Pirson. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 59–64.—Early in the period the measurement of the physical properties of reservoir rocks sprang into importance. 2 fluid flow was studied. The presence of interstitial water was recognized. Capillary pressure measurements were introduced

in 1943. It was realized by Archie that there was a relationship between the resistivity observed in electric logging and the degree of formation water saturation.

The recognition of single vapour phase (condensate) fields in addition to single liq phase and 2-phase fields was an important step. The practice of recycling in condensate fields was introduced.

The material balance relationships were derived and methods were proposed for calculating displacement efficiency. The significance of trapped immobile gas in reservoirs with water drive has been studied experimentally and may alter views on the maintenance of pressure above the bubble point.

Reference is made to production engineering studies on East Texas, Schuler, Haynesville, Cotton Valley, the Spraberry fields, and Persia. G. D. H.

876. Two decades of gun perforating. R. L. Robinson and B. M. Caldwell. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 14–16.—Perforating has made possible oil and gas recovery in fields that otherwise would have been impossible. The first in-place perforators were mechanical, but were not positive, and tended to deform the casing. The bullet perforator was developed in the early 1930s, and after *ca* 15 years shaped charges were introduced. This was positive and had greatly improved penetration. Holes as small as ½ inch can be made. Holes can be made at 45° spacing to improve squeeze cementing. Drill-pipe has been perforated when stuck. An expendable perforator has been made which can be run through tubing to perforate below the tubing, the operation being done with the well-head equipment installed.

The guns vary in form, and the smallest will pass through 2-inch tubing. Firing is mainly electrical, and can be simultaneous or selective.

Open-hole shooting is also employed, and may aid in acidization. Jet casing cutters are available. Jet perforation has been used at 400° F, and bullets at 300°–325° F. Pressures over 1200 p.s.i. have been tackled. G. D. H.

877. Effect of quick-freezing *vs* saturation of oil well cores. F. C. Kelton. *J. Petrol. Tech.*, Jan. 1953, **5** (1), 21–2.—49 pairs of horizontally adjacent core samples have been studied to find the effects of freezing on porosity and permeability. 2-cm cubes were extracted, dried, and tested for air permeability. Saturation with 25,000 p.p.m. brine gave the porosity. Partial de-saturation to *ca* 68% was carried out, and one of each pair was quick frozen and remained frozen for 2 hr. After thawing the sample was washed, and air permeabilities measured on each pair before remeasuring the porosities. The average porosity changes attributable to freezing for the 4 groups of permeability ranges was −2·3 to +3·3%, while the average permeability changes were −0·9 to +4%. However, for the entire group the average permeability change even without freezing was +6·8%, and the average porosity change −0·3%, the corresponding average for the frozen samples being, respectively, +8 and +0·7%. It is concluded that the effects of freezing are less serious than has been inferred from some studies.

86 pairs of samples from 6 wells were similarly studied. The overall average permeability difference was +2·7% for frozen samples and +2·5% for porosity. G. D. H.

878. Improved method of mounting core specimens in Lucite. R. E. Barrett and J. Fatt. *J. Petrol. Tech.*, Jan. 1953, **5** (1), 14.—A thin-walled Lucite tube slightly larger than the final mounting required has a Lucite disk cemented on one end. The core is then centred in the tube, the remaining space being filled with Lucite powder, tapped to minimum porosity, and sealed by a second disk. The whole is then kept in a bath at 250° F for 1 hr, after which 1000 p.s.i. gas pressure is applied for 4 hr before the mount is cooled and machined. G. D. H.

879. Estimation of water injection profiles from temperature surveys. T. J. Nowak. *J. Petrol. Tech.*, Aug. 1953, **5** (8), AIMME Tech. Paper No. 3637, 203–12.—A mathematical analysis of the heat flow processes in water injection wells indicates that the injectivity profiles can be estimated from an accurate measurement of the temp disturbances associated with these processes.

The method requires the combination of the injection and subsequent shut-in logs, the former giving an accurate measure of the thicknesses of the water intake strata, and the latter an indication of major and minor intake rates.

The performances of several water injection wells are analysed, and one is discussed in detail. The analyses show that if the proposed procedure is properly used, accurate data should be obtained on what strata are taking water. Comparisons are made of the injectivity profiles obtained from core analysis, spinner surveys, and temp logs. The usefulness of the procedure has been shown for thick injection intervals, but it is believed to be applicable also to intervals less than 100 ft thick. G. D. H.

880. Development and operation of water injection projects. G. M. Stearns. *J. Petrol. Tech.*, Feb. 1953, **5** (2), 9–12.—Many oilfields do not have an active water-drive, and it is often desirable to inject water into such fields to maintain pressure by replacing fluids extracted, and thereby give greater oil recovery. Such injection may double or treble recovery in some fields lacking a natural water-drive. Pattern water flooding may be inferior to water-injection pressure maintenance. The latter is not instituted early in general because a period of primary production is needed to find whether or not there is a natural water-drive. Co-operation between operators is needed for proper conduct of a water injection project.

In order to illustrate the points involved, the North Calvin pattern water-flood, the Payton water-flood, and the Steamboat Butte primary pressure maintenance project are described. North Calvin produces from a faulted sand lens (Pennsylvania No. 7 sand). About 260,000 brl of oil had been produced to the start of water injection, and since then 365,000 brl. The Tensleep sand at Steamboat Butte has a reasonably active water-drive at low rates of production, but it was decided that the oil output needed on completing the Platte pipeline would lead to excessive pressure drops. Hence it has been decided to inject below the oil–water contact. Reference is made to some associated general problems.

G. D. H.

881. Application of the material balance equation to a partial water-drive reservoir. A. F. van Everdingen, E. H. Timmerman, and J. J. Mahon. *J. Petrol. Tech.*, Feb. 1953, **5** (1), AIMME Tech. Paper No. 3502, 51–60.—The field considered produces from the Wilcox (Eocene) at *ca* 8100 ft. It is on the northern upthrown side of a fault and is broken by a series of faults. Max net sand thickness was *ca* 26 ft, and the max oil column 37 ft. The productive area was 1830 acres. Average permeability was about 236 mD, and average porosity 19·9%; interstitial water was estimated at 15% and the G.O.R. (dissolved) was 900 cu. ft/brl. Volumetric estimates put the original oil in place at $26–25 \times 10^6$ brl. No gas cap was present originally.

The application of the material balance equation with the water influx equation is made, using only field production and pressure data, P.V.T. analyses, and a max of subsurface information. It is concluded that the reservoir is an essentially infinite aquifer with about $25·6 \times 10^6$ brl of active oil in place. The reservoir is shown not to be of infinite linear extent. G. D. H.

882. Permanent-type well completion. T. A. Huber and G. H. Tausch. *J. Petrol. Tech.*, Jan. 1953, **5** (1), AIMME Tech. Paper No. 3494, 11–16.—Permanent-type well completions can greatly decrease the cost of completions and workovers. In these the wellhead and tubing are installed, and the completion and all later operations are performed through the tubing. Tubing type gun perforators have an expendable carrier, and can be as small as 1¾ inches dia. The mud may be displaced before perforations are made, being replaced by water or oil, and a suitable pressure differential arranged so that there is free flow into the well.

Retrievable tubing extensions have been developed for

cementing a producing interval without using a drilling rig. There are also special tubing packers which can be used as squeeze packers and as production packers. They are retrievable or drillable. New gas-lift valve arrangements are being developed for permanent-type completions.

The preparation of a well for a permanent-type completion is described, together with the results of field operations. In some workovers the costs have been only 25% of those employing former methods. G. D. H.

883. Review of the chemical treatment of wells. P. E. Fitzgerald. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 11–13.—In 1952 over 65,000,000 gal of chemicals were used in 45,000 wells in the U.S.A. and Canada. In 1895 Krasch and Van Dyke experimented with acidization in the Trenton. Interest lapsed, but in the 1920s attempts were made to remove "gyp" deposits from tubing by chemicals, and in 1927 the discovery of oil in limestones in central Michigan led to experimental acidization, at first of brine wells. In 1932 inhibited acid was used in an oil well, increasing output substantially. By the end of the year 300 wells had been treated. There was much research on suitable equipment. Fluorides were added in 1933 to speed the action on dolomites and siliceous rocks. Solvents to attack silicates and muds followed. Corrosion inhibitors are now available which at 350° F limit metal loss to 0·03 lb/sq. ft/day. Selective acidizing after evaluating permeability with the Electric Pilot is now used. Some compounds reduce the swelling of clays in the reservoir rock. Highly viscous fluids carrying graded sand are being injected to fracture the rocks, and in 4½ years 30,000 treatments have been made. G. D. H.

884. Capillary desaturation in unconsolidated beads. F. T. Bethel and J. C. Calhoun. *J. Petrol. Tech.*, Aug. 1953, **5** (8), AIMME Tech. Paper No. 3639, 197–202.—Glass beads of 0·0035–0·0041 inches dia, after cleaning in a standard manner, were immersed in soln of Dri-film to give them varying degrees of wetting by *n*-octane. 0·01, 0·1, and 1% Dri-film soln in toluene were used. Capillary desaturation curves were obtained, using water as the displacing agent. The curves showed increasing displacement pressures with increase in oil wetness. Apparent contact angles between *n*-octane and water on glass were computed at several saturations. The residual wetting liq saturations were in the reverse order to the displacement pressures, and a semi-logarithmic variation existed between the apparent contact angle and the residual saturation.

It appears that the wetting liq ceases to be a continuous phase within individual pores before the capillary pressure can be made sufficiently high to force out the wetting phase completely. The wetting liq saturation at which this break in liq continuity occurs is higher as the oil wetness decreases. G. D. H.

885. Laboratory investigation of oil displacement from porous media by liquefied petroleum gas. J. H. Henderson, N. B. Gove, H. J. Ledbetter, and J. D. Griffith. *J. Petrol. Tech.*, Feb. 1953, **5** (2), AIMME Tech. Paper No. 3501, 33–40.—The results of a series of laboratory flood tests using liquid *iso*butane to displace refined oils from test cores containing interstitial water are presented and discussed. There was similarity between the miscible fluid and immiscible fluid displacement mechanisms. Normally *iso*butane gives recoveries of over 95% of the initial oil, by employing volumes of *iso*butane volumes 4–6 times the volume of oil produced. Reduction of the pressures in flooded cores to atmospheric gave virtually 100% recovery of *iso*butane. The primary and subordinate phases of oil recovery were dominated by the oil–*iso*butane viscosity ratios. Recovery in the primary phase ranged 80–10% as the viscosity ratios ranged 3–1250. Oil displacement up to 75% recovery was not demonstrably affected by injection rate. The presence of free-gas prior to *iso*butane break-through increased the volume of *iso*butane needed to recover a given percentage of oil. Injection of liq *iso*butane prior to water flood resulted in a marked improvement in oil recovery by water flood. G. D. H.

886. The exercise of control of flowing wells and of input to gas lift installations by means of a differential flow control valve. L. R. de Verteuil. *J. Inst. Petrol.*, 1953, **39**, 819–45.—The deficiencies of fixed or adjustable chokes as controllers of production from flowing wells or the gas input to gas lift wells are discussed, and the advantages of a differential flow controller in either of these services are pointed out. A. R. W. B.

887. The microlateralog. H. G. Doll. *J. Petrol. Tech.*, Jan. 1953, **5** (1), AIMME Tech. Paper No. 3492, 17–32.—The microlateralogging device is intended to measure the resistivity of the invaded zone within about 2 inches of the well bore. It employs concentric circular electrodes in a rubber pad pressed against the side of the hole. An automatic device beams the current horizontally into the formations, the zone of flow being trumpet-shaped. Except when the mud cake is thick, the resistivity of the invaded zone is given directly; for thick cakes a correction is easily made.

The theory of the method and the nature of the device are described in detail, together with the application of the method. Several field examples are given, and the use of the device for estimating porosity is outlined. G. D. H.

888. Micro or macro? Why not filtration? W. Kulczycki and W. Schiller. *Nafta* (*Krakow*), 1953, **9**, 142–5.—2 articles offering criticism of the new conception of microhydraulics. The first points out that laws of motion on micro scale cannot be determined. Further, there is general understanding of the fact that "filtration" means both separation of solids from fluids and fluid motion through porous medium. Linear filtration law ($(dP/dx)^n = Q/C$ when $n = 1$) applies even if direction of flow is not towards any central point and by integration using average k and η the idea of micro scale examination is lost. An error was made by Prof. Wilk in considering repressurizing and flooding, together with well shooting or acid treatment, since the first 2 methods include introduction of fresh energy into the reservoir. All these methods as well as careful control of flow pressure, measurements, and gas cycling are not new, but none the less Prof. Wilk did well to remind the Polish production engineer of them all. He has also done a great service by trying to define the many pressures encountered during measurements in a producing well, although saturation pressure for gas in crude oil is derived equally well from Dalton's or Henry's law. M. S.

889. Electric heaters for periodical heating of wells. J. Ostaszewski. *Nafta* (*Krakow*), 1953, **9**, 123–5.—The difficulties encountered in this solution of the problem of increased production were dia and insulation of power transmission in the well, as well as their cost. Instead, casing pipe and pumping rod were eventually used. Current of *ca* 4·0 A at 220 V was used for well producing up to 500 kg of oil/day with only little water. Method of mounting, operation, and subsequent production is described with illustrations. M. S.

890. Performance predictions incorporating gravity drainage and gas cap pressure maintenance—LL-370 area, Bolivar coastal field. D. R. McCord. *J. Petrol. Tech.*, Sept. 1953, **5** (9), AIMME Tech. Paper No. 3653, 231–48.—Details are given of a method for predicting the recovery under natural depletion and gas cap pressure maintenance, incorporating gravity drainage. The method is useful where comparative recovery predictions are needed for one or more cases of natural depletion and pressure maintenance, and where the reservoir is not too heterogeneous. The reservoir studied had no water advance and no original gas cap. Conventional fluid flow equations are used, no pressure or production restrictions are needed, and no conformance factors are used. Details are given of the rock and fluid properties. G. D. H.

891. Equilibrium constants for a gas-condensate system. A. E. Hoffmann, J. S. Crump, and C. R. Hocott. *J. Petrol. Tech.*, Jan. 1953, **5** (1), AIMME Tech. Paper No. 3493, 1–10.—Portable equipment for gas-condensate testing is described, and studies have been made involving operating the high

pressure separator successively at 2900, 2500, 2000, 1500, 1000, and 500 p.s.i.g. The low pressure separator operated at 250 p.s.i.g. Gas–liq ratios and separator liq densities were measured at each temp, and liq was collected for laboratory examination. In the laboratory the saturation pressure was measured, and the reservoir fluids were analysed, and comparable analyses were made of the gas and liq samples obtained from the field separator and from the portable test equipment. The data were smoothed by Buckley's procedure in which log (equilibrium constant × absolute pressure) is plotted against $b(T_B - T)$, b being a constant for the particular hydrocarbon, T_B its b.p., and T the temp in °R.

The equilibrium constants, especially at high pressure, are sensitive to composition.

The experimental data and derived K values are presented. G. D. H.

892. Compressibility of Saint-Marcet natural gas : its measurement and application. J. P. Verrien. *Rev. Inst. franç. Pétrole*, Sept. 1953, **8** (9), 454–65.—The perfect gas laws and the modifications and devices used in practice are briefly described. There is also a description of the principles, apparatus, and method used in studying the compressibility of the Saint-Marcet natural gas. The measurements and corrections are discussed.

The gas had 0·9226 mol CH_4, 0·0408 mol C_2H_6, 0·0053 mol C_3H_8, 0·029 mol N_2, and traces of CO_2, butanes, and pentane. A table gives the compressibility at temp of 0°, 10°, 20°, 30°, and 40° C, and at pressures rising by 10-kg/cm² intervals from 0 to 350 kg/cm². The experimental data are also presented graphically. The calculated and measured compressibilities are compared. Both series of values are consistently below those measured for methane at 0° C, and the calculated values for Saint-Marcet are below those measured. G. D. H.

893. Analogue study of the transitory radial flow of gas in a porous medium. A. Houpert. *Rev. Inst. franç. Pétrole*, Apr. 1953, **8** (4), 129–51; May 1953, **8** (5), 193–222; June 1953, **8** (6), 248–76.—The steady state flow of a gas well is given by $Q = \alpha\,(p_r^2 - p_a^2)^n$, α and n being two constants, and P_r and P_a, respectively, the closed-in and flowing bottom-hole pressures. This relationship is derived analytically, and Poiseuille's and Darcy's equations are shown to be analogous, and the substitution of a capillary tube system for a porous medium is examined. The analogue apparatus is described.

Radial flow of a perfect gas with constant output pressure was studied experimentally, and Everdingen and Hurst's results were verified. Also the effects of variation of outlet pressure were investigated. The experimental results were applied to the study of natural gas accumulations.

The flow of gas in reservoirs departs appreciably from Darcy's law. Turbulence is unlikely except in fissures. Nevertheless, it is considered that the results obtained in the analogue apparatus are applicable.

α and n are usually obtained by the back-pressure test procedure, but this is wasteful because it involves 4 stabilized flowing states. A cheaper method is proposed in which the $\dfrac{\text{thickness} \times \text{permeability}}{\text{visc}}\left(\dfrac{hk}{\eta}\right)$ is obtained from a build-up curve following a period of low flow rate. n is obtained from 2 transient flows of short duration, while α may be calculated from n and $\dfrac{hk}{\eta}$, with an error not exceeding 20%.

The method is applied to the Cap Bon gas accumulation, and the result agrees within 13% with that obtained directly. G. D. H.

894. Equilibrium vaporization ratios for nitrogen, methane, carbon dioxide, ethane, and hydrogen sulphide in a natural gas-condensate system. R. H. Jacoby and M. J. Rzasa. *J. Petrol. Tech.*, Sept. 1953, **5** (9), AIMME Tech. Paper No. 3652, 225–30.—Experimental equilibrium ratios were obtained for N_2, CH_4, CO_2, C_2H_6, and H_2S in natural gas-condensate systems over the pressure range 500–4000 p.s.i.a. at 100° and 150° F. In each of the 2 mixtures the N_2, CO_2, and H_2S each represented 3 mol %, while the natural gas and de-propanized condensate were 71 and 20 mol %, and 81 and 10 mol %, respectively. The experimental phase analysis data are tabulated, and phase diagrams and K values are plotted. One mixture had a critical point at 204° F and 3875 p.s.i.a. Comparison of these and earlier data are made with the Kellogg correlation at 100° F and 1000 p.s.i.a. G. D. H.

895. Wildcatting in Madagascar. A. Koen. *Bull. Ass. franç. Tech. Pétrole*, Sept. 1953, 33–45.—Search for oil in Madagascar began in 1907. Before the war the work was in the northern basin of Morondava where there are seeps of heavy oil.

Post-war geological and geophysical work indicated the southern part of this basin to be most valuable, although requiring very deep wells.

At the Tulear base prefabricated bungalows are used for European personnel, and masonry houses for the local employees. Stores and workshops have been constructed, together with offices, a laboratory for heavy mineral studies and an office for the examination of aerial photographs.

A classic derrick is used, but a portable mast may be preferable. A Wilson Giant Torcair rig is employed. Fuel and lubricants accounted for a third of the well costs in 1952. The wells encounter thick beds of sandstones, which make drilling slow and rapidly dull the bits.

The constructional and personnel problems of a camp at the well site are discussed, together with the matters of transport, for some wells were several hundred kilometres from Tulear. Quite extensive road-making work had to be undertaken, and many small streams (dry except after storms) had to be crossed. Radio communication with the base was established. G. D. H.

896. Patents. U.S.P. 2,655,934 (14.12.49; 20.10.53). L. C. Clair, assr to M. S. Whitfield, W. E. Worley, R. F. Peterson, and J. D. Dyal. Safety shutoff device for oil and gas wells.

U.S.P. 2,655,996 (4.10.51; 20.10.53). C. W. Earl and W. H. Middleton. A gas and liq actuated paraffin cleaner for flowing oil wells. D. A. R.

U.S.P. 2,657,576 (3.3.47; 3.11.53). R. O. Boykin. Perforation production tester.

U.S.P. 2,657,641 (20.4.51; 3.11.53). K. R. Lung, assr to Flint and Walling Manufacturing Co. Jet pump for wells.

U.S.P. 2,658,457 (15.12.50; 10.11.53). D. T. Harbison. Insert rod pump for wells.

U.S.P. 2,658,460 (9.2.50; 10.11.53). L. F. Davis, assr to Atlantic Refining Co. Electrically-operated gas lift valve.

U.S.P. 2,658,581 (30.8.51; 10.11.53). P. M. Rider. Oil trap for the suction line of an oil well.

U.S.P. 2,660,246 (1.6.48; 24.11.53). H. C. Otis and J. C. Luccous. Well fluid flow regulator.

U.S.P. 2,660,249 (18.11.49; 24.11.53). J. J. Jakosky. Means for heating oil wells.

U.S.P. 2,660,458 (15.2.49; 24.11.53). L. B. Collins and C. A. Langstaff. Packing unit for a well pump rod.

U.S.P. 2,660,550 (27.8.49; 24.11.53). D. M. Updegraff and G. B. Wren, assrs to Socony-Vacuum Oil Co. Water containing a culture of bacteria of the hydrocarbon-oxidizing species of the genus *desulphovibrio*, and molasses as a nutrient therefor, is injected into an oil-bearing earth formation for secondary recovery of oil. J. M. S.

OILFIELD DEVELOPMENT

897. World output drops. D. M. Duff. *Oil Gas J.*, 4.1.54, **52** (35), 57.—Production in the U.S.A. in Oct. 1953 fell by approx 296,000 b.d. compared with the previous month, and world production also fell.

Oil production for Sept., Oct., 1953, and Oct. 1952 is tabulated by countries and totalled for areas. C. A. F.

898. Andrews leads 1953 discoveries. C. Hoot. *Oil Gas J.*, 11.1.54, **52** (36), 157.—The most significant West Texas discoveries in 1953 were in Andrews County, where oil was found in beds ranging from the Wolfcamp to Devonian and Ellenburger.

The 17 important discoveries, new pays, and extensions in 1953 are listed, and a key map is provided. C. A. F.

899. San Ardo field—history of development. H. O. Miller. *J. Petrol. Tech.*, Jan. 1953, **5** (1), 11–13.—Early difficulties showed the need for completions with gravel-packed slotted liners, and that wells should be completed 50–75 ft above the water table to preclude water coning, while casing was cemented below the gas–oil contact to prevent gas coning.

West of the Salinas river there has been trouble with lost circulation. Wells have been deflected 500 ft laterally under the river.

The Lombardi sand has 20 ft of gas and a max of 230 ft of oil; average porosity 33%; permeability 4000 mD; oil gravity 10·6°–12·1° API, and visc 300,000 S.U.sec. at 80° F; G.O.R. 15–100 cu. ft/brl, B.H.P. 900 p.s.i. 242 wells have produced 5,400,000 brl of oil to date.

The Aurignac sand has 2 small gas caps, and a max productive thickness of 200 ft; average porosity 30%, permeability 1350 mD; oil gravity 12°–13·5° API, and visc 26,000 S.U.sec. at 80° F. 116 wells have given 2,300,000 brl of oil.

Pumps (electrically powered) are installed on completion, even though some wells would flow. Allowables are about 100 b.d. The oil has to be heated to 180° F to break down foam, and 4 brl of storage is needed per brl of daily production. G. D. H.

900. Depth records broken in six areas. J. C. McCaslin. *Oil Gas J.*, 25.1.54, **52** (38), 129.—The world's deepest well is 72–4 K.C.L. in Paloma field, Kern County, California, which is fishing at 21,482 ft in Miocene. The well was spudded in 1951 to test Tertiary horizons below the upper Miocene pay at 11,000 ft.

The world's deepest producer is 67–29 Coles Levee A in the North Coles Levee field, Kern County, which was completed for 119 b.d. from a zone between 17,500 and 17,892 ft.

Tables show wells drilled in the U.S.A. for 1953 classified by depths and areas. C. A. F.

901. Ventura Avenue sets new high. D. H. Stormont. *Oil Gas J.*, 25.1.54, **52** (38), 417.—Exploratory drilling at Ventura Avenue, California, has resulted in the development of a deep zone, the D-8, and extension of the D-5, D-6, and D-7 pays has increased field production by 13,000 b.d. in a year. Field production is 90,000 b.d., the highest since the field was discovered over 38 years ago.

Miocene pays have not been confirmed but are expected. C. A. F.

902. United States—a review of 1952 production. M. Williams, H. J. Clark, and L. W. Chasteen. *J. Petrol. Tech.*, March 1953, **5** (3), 11–14.—45,800 wells were drilled in the U.S.A. in 1952. 1500 were for injection or disposal. The average depth of all wells was 4100 ft. There were 10,600 exploratory wells, 1500 giving oil and 300 gas. 23,500 oil wells and 3300 gas wells were completed. Average daily output of oil and condensate was 6,270,000 b.d. Texas gave 45% of this. 12 of the 27 producing states gave more oil in 1952 than in 1951. 8×10^{12} cu. ft. of gas were marketed in 1952.

29 oil and 6 gas discoveries were made in the Denver–Julesburg basin in the Dakato–Lakota series. There was much geophysical activity in the Rocky Mountain area.

The Spraberry activity has fallen off because of high well costs and reduced estimates of ultimate recovery. The trend has about 435,000 acres of proved or semi-proved area. In the north-east of the Midland Basin of Texas reef production has been found in Fisher County. 21 wildcats were successful in pre-Permian beds in the Northwest Shelf area of Lea County, New Mexico. High gravity oil has been found in dolomite in the western part of the Anadarko basin. 30 oil and 26 gas or condensate pools were opened in Louisiana. Gas with condensate was discovered in the Mississippian of North-west Mississippi. California had 8 new oil fields and 3 new gas fields. G. D. H.

903. Canada—a review of 1952 production. E. W. Shaw. *J. Petrol. Tech.*, March 1953, **5** (3), 17–18.—Western Canada produced about 61,000,000 brl of oil in 1952, and 1393 development wells were drilled. Joseph Lake–Camrose, Wizard Lake, Leduc, and Coleville and Fosterton were the areas of main activity. Reserves rose from 1330 to 1920 million brl in 1952. A max of 167 seismic crews were at work, and 836 exploration wells were drilled, 220 being in Saskatchewan. There were 119 oil and 92 gas discoveries; Bonnie Glen, 35 miles south-west of Edmonton, was the most important find, the D-3 reef had 300 ft of oil and 400 ft of gas. An area 4 miles by 1 mile has been outlined. 6 miles away is Five-lands with 240 ft of oil and 250 ft of gas in the D-3. The Nevis wet gas field is in the coalesced D-2 and D-3.

Proven and probable gas reserves of 1446 M.M.M.c.f. are estimated for 12 zones (Lower Cretaceous, Triassic, and Permo-Pennsylvanian) of the Fort St John area, British Columbia. At Sturgeon Lake an 85-ft oil column has been found in the D-3.

Medium gravity oil has been found in the Jurassic and sometimes in the Lower Cretaceous in the northern part of the Williston Basin in Saskatchewan and Manitoba. Light oil has been found in the Mississippian of Manitoba. G. D. H.

904. South America—a review of 1952 production. De Golyer and MacNaughton Inc. *J. Petrol. Tech.*, March 1953, **5** (3), 19–20.—Argentina's output averaged 66,870 b.d. in 1952. Reserves are placed at 300,000,000 brl. Chile's output was 2500 b.d., with reserves of 30,000,000 brl. Colombia averaged 105,495 b.d. crude oil and 2338 b.d. condensate. Bolivia produced nearly 1500 b.d., with reserves of 21,500,000 brl. Ecuador's average was 7700 b.d., and the reserves are 30,000,000 brl. Reserves of 170,000,000 brl are estimated for Peru, where the production was 44,700 b.d. oil and 3000 b.d. condensate.

In Uruguay geophysical work and test drilling were carried out in the basalt covered basin in the northwest.

Brazil produced 750,000 brl of oil in 1952, and there was geological and geophysical exploration. Venzuela produced 1,797,450 b.d., and 1130 producers were completed. G. D. H.

905. Middle East—a review of 1952 production. A. H. Chapman. *J. Petrol. Tech.*, March 1953, **5** (3), 23–5.—Kirkuk produced 155,000,000 brl of oil in 1952. The new pipeline to Banias was completed. 250,000 tons of oil were piped from Ain Zalah, while Zubair exported 2,250,000 tons.

North of Burgan, in Kuwait, the Magwa field was opened. 4 miles north-east of Burgan Ahmadi-1 was completed as a producer. Burgan averaged about 750,000 b.d.

Qatar produced 69,000 b.d. Bahrain gave 30,000 b.d. and now has 4 gas-injection wells. Saudi Arabia produced 824,756 b.d.

Notes are given on pipeline and other construction, while tables give details of Middle East production in various years and world crude oil reserves. G. D. H.

906. Europe—a review of 1952 production. A. H. Chapman. *J. Petrol. Tech.*, March 1953, **5** (3), 27.—In 1952 Germany produced 12,400,000 brl of oil. The 2,900,000 brl increase over 1951 came mainly from Ruhlermoor–Ruhlertwist, Hohne, Suderbruch, Eldingen, and Hemmelte West. 1952 discoveries were Boosted, Ploen, Lehrte Hohenwodhrden, Vorhop, Aldorf, and Stockstadt. France gave 2,050,000 brl, about a quarter coming from Lacq. Holland gave 13,700 b.d., the United Kingdom 1100 b.d., and Italy about 1300 b.d. Italy's gas output was over 52,000 M.M.c.f. Considerable extensions were made to gas pipelines. Oil exploration has taken place in the Ebro Valley of Northern Spain. G. D. H.

907. Germany sets record. Anon. *Oil Gas J.*, 8.2.54, **52** (40), 72.—1953 output in Western Germany was approx 42,500 b.d., compared with approx 34,000 b.d. in 1952. Production has been quadrupled since 1946.

Most of the production comes from the Hanover–Celle area, where new fields have been found at Hohne, Eddess-Nord, and Lehrte. The Emsland area ranked second, and a sharp increase in production has been reported from the fairly new producing area in South Oldenburg.

Between the Emsland and Hanover areas there is a 70-mile belt of complex stratigraphical conditions in which 8 new fields were found in 1953.

Over 100 rigs are now operating in Western Germany.

C. A. F.

TRANSPORT AND STORAGE

908. Oil line mileage hits peak in '53. Further expansion is forecast. Anon. *Pipe Line News*, Dec. 1953, **25** (12), 19–20.—It is estimated that a record total of 8668 miles of principal crude oil and products pipelines will be built and placed in service in the U.S.A. in the 12 months ending Dec. 1953. This total comprises 5168 miles of crude oil lines and 3500 miles of products lines. Even greater expansion is forecast for 1954. Details are given of all the major lines built in 1953 or scheduled to be completed in 1954. S. R. H.

909. Recent developments in product pipelines. S. S. Smith. *Pipe Line News*, Dec. 1952, **24** (12), 26–32.—A review. S. R. H.

910. Pipeline organization. H. M. Anderson. *Pipe Line News*, Dec. 1952, **24** (12), 22–5.—Discussions of employer-management relationships *vs* efficient organization. S. R. H.

911. The gas turbine. Its place in pipeline pumping. J. O. Stevens. *Pipe Line News*, Nov. 1952, **24** (11), 35–9.—An economic evaluation of the use of gas turbines for the pumping of natural gas, based on a hypothetical 1000-mile 26-inch line. Actual test data on a 1850-h.p. gas turbine at Wilmar, Arkansas, support the claim that gas turbines can be used to advantage. S. R. H.

912. The economics of packaged compressor plants. E. S. McRoberts. *Pipe Line News*, Jan. 1954, **26** (1), 19–22.—Statistics are given to show that economy is obtained in construction, housing, and maintenance of self-contained transportable compressor units. S. R. H.

913. New compressor stations boost United Gas System capacity. Anon. *Pipe Line News*, June 1953, **25** (6), 19–22.—The new stations are designed to give efficiency, reliability, and safety by use of heavy duty 1600-h.p. natural gas engines with ample protective accessories and automatic safety devices. S. R. H.

914. Underground storage. Anon. *Oil Gas J.*, 1.3.54, **52** (43), 78.—The experience is reported of Lion Oil Co with storage of volatile hydrocarbons. 3 underground storage wells were drilled and cavities totalling 75,000 brl capacity developed, of which 34,000 brl was utilized for propane during summer months of 1952.

It is stated that such storage of butane, propane, and gasoline in salt formations could be developed at a cost of $1.00/brl, as against installed cost of steel propane storage tanks of approx $17.00/brl. Diagram illustrates typical underground storage-well installation. G. A. C.

915. How to achieve optimum flow for minimum cost. J. W. O'Leary. *Oil Gas J.*, 15.3.54, **52** (45), 147.—An automatic pipeline system is described. Telemetering, station protection, and typical equipment are dealt with. G. A. C.

916. Transport and distribution of petroleum products. P. Lipka. *Nafta* (*Krakow*), 1953, **9**, 121–3.—Description and classification of various means of transport is followed by relevant Polish legal safety code. Existing shortages make it imperative that wax and asphalt is sold only on permits, and lubricants (to the extent of 5% of petrol purchased) on return of 30% of its volume of used oil for regeneration purposes. M. S.

917. Offshore deliveries of fuel oil through a submarine pipeline to Moss Landing steam plant. S. P. Johnson and E. A. Salo. *Pipe Line News*, Jan. 1954, **26** (1), 23–30.—Pipeline consists of 200 ft of 12-inch, neoprene-lined flexible hose running from tanker to sea bed, 3600 ft of 18-inch steel pipe mainly under water, and 4500 ft of 24-inch steel shore line. Corrosion protection obtained by coating and cathodic protection methods. High visc bunkering fuel is handled without recirculation and an overall heat transfer coeff of 5 B.T.U/sq. ft/hr/°F was calculated between pipe and sea water. Flow rates were limited by ships' pumping capacity, and final rates of 7000 brl/hr have been achieved. Details of installations and operating procedures are given. S. R. H.

918. Rancho system. Anon. *Pipe Line News*, July 1953, **25** (7), 23–39.—Description of the design, construction, pumping, and terminal facilities and control systems of the new Mesa to Houston crude oil pipeline having a throughput of up to 345,000 b.d. S. R. H.

919. Radioactive control of products pipeline operations. D. E. Hull and B. H. Fries. *Pipe Line News*, Aug. 1953, **25** (8), 46–8.—By injecting a radioactive tracer into a pipeline at the interface of a changeover from one product to another the passage of the interface can be checked along the line. Successful operations on the Salt Lake City–Pasco line during the last 2 years support the claim that this method reduces the waste volume of contamination on changeover. S. R. H.

920. Micro-wave channelizing. L. E. Adler. *Pipe Line News*, Apr. 1953, **25** (4), S1–S4.—The advantages of using the 88B. AM system of microwave multiplexing are outlined. S. R. H.

921. Microwaves for pipe liners. C. B. Lester. *Pipe Line News*, Nov. 1952, **24** (11), 46–52; Dec. 1952, **24** (12), 33–40; Jan. 1953, **25** (1), 52–60; Feb. 1953, **25** (2), 33–41; March 1953, **25** (3), 34–45; May 1953, **25** (5), 41–52; June 1953, **25** (6), 39–48; July 1953, **25** (7), A1–A8; Aug. 1953, **25** (8), A1–A8; Feb. 1954, **26** (2), 41–9; Nov. 1953, **25** (11), 58–65; Dec. 1953, **25** (12), 33–40.—A comprehensive review of the use of microwaves for communications and theory, construction, and maintenance of microwave equipment. S. R. H.

922. How to stop troublesome pulsation without excess pressure drop. C. N. Taylor. *Oil Gas J.*, 15.3.54, **52** (45), 113.—Pt 2 of this article gives an equation concerning the ratio of the average energy of the transmitted wave at the outlet of the dampener to the average energy of the incident wave at the inlet of the dampener. Limitations of the equation are discussed. Determination of dampener size and other applications of dampeners, frequency calculations, and elimination of vibration are dealt with. G. A. C.

923. New hydraulic slide rule solves problems in fluid flow for pipelines. W. C. Kennedy. *Oil Gas J.*, 8.2.54, **52** (40), 103.—The slide rule developed by Service Pipe Line Co is described, and its use illustrated.

Any one of the 5 variable factors—flow rate, pressure, dia, visc, and sp. gr.—can be determined under conditions of either streamline or turbulent flow if the other factors are known. Rule is stated to be as accurate as accepted formulæ and charts. G. A. C.

924. Capacitance recorder in pipeline applications. J. D. Jones. *Oil Gas J.*, 1.3.54, **52** (43), 65.—The recorder can be widely applied in the solution of pipeline measurement problems. The presence and amount of B.S. & W. in crude oil pipelines can be detected and recorded with limits previously impossible; ability to detect the product interface in products pipelines suggest wide use for that purpose.

Charts are shown, and a table gives field test data on products batches. G. A. C.

925. Instrument application in the products pipeline industry. H. R. Hoyt. *Pipe Line News*, Nov. 1952, **24** (11), 27–30.—The use of pneumatic controls in pipeline systems is described to give automatically synchronized pumping rates at all stations regardless of changes in throughput or density of products. A modified controller is described which is claimed to overcome instability and surging. S. R. H.

926. The role of fibrous glass in underground pipe protection. R. W. Farris. *Pipe Line News*, Nov. 1952, **24** (11), 31–4.—Experimental details are given illustrating the advantages of using fibrous glass mats for pipeline enamel protection. S. R. H.

927. Compressor bottle failures. C. Wurgler. *Pipe Line News*, Feb. 1953, **25** (2), 23–4.—Reducers and special pipe fittings are claimed to cut out stress changes, and hence eliminate failures at the necks of compressor bottles. S. R. H.

928. Suppression of pulsations in natural gas lines. Anon. *Pipe Line News*, July 1953, **25** (7), A14–A16.—A non-technical outline, together with a description of a pulsation reducing chamber. S. R. H.

929. Economics of pigging and purging and scraper traps. E. T. Robinson. *Pipe Line News*, Aug. 1953, **25** (8), 34–8.—A discussion of the advantages of internal cleaning of pipelines by means of scrapers which move along in the gas stream. It is claimed that the ease and low cost of an annual overhaul, when the pipe efficiency falls, make the installation of the traps for scrapers well worth while. S. R. H.

930. Unique reclaiming operation salvages porous plungers. E. Sterrett. *Pipe Line News*, March 1953, **25** (3), 19–20.—It is claimed that by building up a brass cap over the ends of reciprocating pump plungers and metallizing the plungers, leakage of oil through the porous casting metal is eliminated and the plungers can then be remetallized and used again when worn. S. R. H.

931. Platte pipeline system completed. Anon. *Pipe Line News*, Jan. 1953, **25** (1), 31–49.—A description of the planning, design, and construction of 1056-mile crude oil pipeline from Chatham, Wyoming, to Wood River, Illinois. The pipeline has a potential capacity of 100,000 b.d. Details of the pumps and pumping station layouts are given. S. R. H.

932. West Texas Gulf pipeline system. E. Sterrett. *Pipe Line News*, Aug. 1953, **25** (8), 20–34.—A description of the new 26-inch line and pump stations carrying Permian Basin crude oil to the Gulf Coast refineries, Texas. S. R. H.

933. Pioneer pipeline establishes new records. E. Sterrett. *Pipe Line News*, Sept. 1953, **25** (9), 18–24.—A description of the 8-inch products pipeline from Salt Lake City to Sinclair Refinery. The capacity is 12,000 b.d. S. R. H.

934. Giant stride. E. LeBoeuf. *Pipe Line News*, Sept. 1953, **25** (9), 27–32.—A description of the laying of a 20-inch oil pipeline across the 4-mile wide, 270-ft deep Mackinac Straits. S. R. H.

935. Sinclair's "Big Inch" modernizes company pipeline system. E. Sterrett. *Pipe Line News*, Oct. 1953, **25** (10), 34–43.—Details of the 22–24-inch crude oil pipeline from Cushing, Oklahoma, to E. Chicago, Ind. S. R. H.

936. Cathodic protection of under-river pipelines. C. C. Lloyd and J. R. Whitney. *Pipe Line News*, Oct. 1953, **25** (10), 46–52.—A description of the installation used by the Esso Standard Oil Co to protect 7 crude oil pipelines crossing the Mississippi. S. R. H.

937. Trans Mountain line. Anon. *Pipe Line News*, Nov. 1953, **25** (11), 25–43.—A comprehensive description of the design, construction, and operation of the 718-mile, 24-inch crude oil pipeline. The design is for a 200,000-b.d. throughput requiring 6 pumping stations. Communications are difficult and a system using telephone, teletype, and radio facilities is preferred to microwave systems. S. R. H.

938. Shell's new products line embodies new and old units. Anon. *Pipe Line News*, Dec. 1953, **25** (12), 29–31.—A description of the 14-inch products line which stretches for 279 miles through Illinois and Indiana. The line has a capacity of 85,000 b.d., with a possibility of a max of 120,000 brl. S. R. H.

939. Panama-Williams complete Shell's multiple crossing. B. Quarles. *Pipe Line News*, Jan. 1954, **26** (1), 42–3.—3 12-inch and 4 8-inch lines were simultaneously pulled 2500 ft across the Houston Ship Canal. 3 900-ft sections were used of 30-ft cross-section. The pipes were double coated and wrapped, and additional protection was given by 1–2 inches of reinforced concrete. S. R. H.

940. Salt Lake pipeline adds new loop line from Salt Lake City to Boise. R. K. Bond and F. F. Mueller. *Pipe Line News*, Apr. 1953, **25** (4), 23–5.—The new 8-inch loop line has increased the products capacity from 20,000 to 35,000 b.d., and runs parallel to the original. S. R. H.

941. Crosssing a wide deep river with two pipelines. J. E. McClinton. *Pipe Line News*, Apr. 1953, **25** (4), 26–30.—A description of the rock blasting involved in crossing the 4000-ft wide Tennessee River at Pride, Alabama, with 26- and 30-inch parallel pipelines 50 ft apart. S. R. H.

942. Electronic controls for product pipeline terminals. C. H. Scruggs. *Pipe Line News*, June 1953, **25** (6), 29–32.—A description of the operation and application of an electronic device for control of electrical equipment used for the safe and economical loading of petroleum products into transport trucks. S. R. H.

943. When pipelines take a water route. P. H. Timothy. *Oil Gas J.*, 1.2.54, **52** (39), 54.—This is Pt 2 of the article on laying concrete-coated pipe. Diagrams show positions of pipe supports on craft and making ties in canal laying. G. A. C.

944. Trans-mountain oil pipeline in Canada. Anon. *Engineer Lond.*, 1954, **197**, 239–43.—In order to develop markets for Leduc and Redwater fields of Alberta, a 718-mile, 24-inch dia line from Edmonton to Vancouver has been built at a cost of $93 million. Line capacity is 200,000 b.d., and there are 6 pumping stations to cover variable elevations up to 4000 ft over the Rocky Mountains. Pipe buried throughout route as safeguard against landslides, snowslides, and cold. Terminal tankage allows for handling of at least 3 different types of crude. Water testing of line complete by Sept. 1953, max pressure in one section 1425 p.s.i. A. C.

945. Sprayed insulation reduces maintenance. Anon. *Petrol. Process.*, 1954, **9** (2), 245.—The problem of maintenance of insulation on fuel oil and other storage tanks at the Chicago refinery of Sinclair Oil Co has been reduced by the application of a light-weight mastic coating, by means of a spray gun, at relatively low cost. It is estimated that heat loss is reduced by approx 50% for tankage containing liq at temp up to 200° F. J. W. H.

946. Underground storage of natural gas. E. Sterrett. *Pipe Line News*, March 1953, **25** (3), 29–32.—A discussion of the practical aspects of using depleted gas fields and salt domes for storage purposes. S. R. H.

947. Evaporation loss of petroleum from storage tanks. Anon. *Pipe Line News*, March 1953, **25** (3), 62–9.—A review of the basic theory and mechanism and an outline of the practical problem. S. R. H.

948. Why storage tanks fail. F. J. Feely and M. S. Northup. *Oil Gas J.*, 1.2.54, **52** (39), 73.—An investigation is reported on 2 unusual tank failures at Fawley. Welding defects of appreciable size, inspection and inspection tools insufficient to locate gross initiating defects were among causes of failure. A steel having better impact properties is required. G. A. C.

949. Reducing evaporation losses of crude oil. E. G. Ellerbrake and F. Veatch. *Petrol. Times*, 13.11.53, **57** (1468), 1133.—A new method is described for reducing evaporation losses from cone-roof tanks by floating a layer of " foam " composed primarily of spherical hollow particles called " micro-balloons."

Evaporation loss reductions above 80% are shown by field test data. Methods of installation, gauging prevention of foam loss, and effect on vapour combustibility are discussed. G. A. C.

950. Reduce evaporation with plastic foam. E. G. Ellerbrake. *Petrol. Refin.*, 1954, **33** (1), 137–41.—The problem of evaporation of petroleum products from storage tanks is very important, especially where the existing vapour conservation techniques cannot be used. The use of a ½-inch layer of phenolic resin spheres of 0·0013 inches dia floating on the surface reduces this loss by 80% when using crude oil. Tests have been made on both 22-ft and 88-ft dia cone-roof tanks containing crudes, but no work has yet been done with more volatile products. The foam can be applied by pumping into the tank a mixture of spheres and oil, and it is estimated that the initial cost is recovered in one year by reduction in vapour losses. R. D. S.

951. Piping problems of Oakford storage plant. R. C. Reutzel. *Pipe Line News*, March 1953, **25** (3), 25–9.—A description of the Oakford compressor station and storage pool under construction at Delmont, Pennsylvania, for the underground storage of natural gas. The storage consists of 2 underground pockets, with capacities of 85 and 20 billion cu. ft. at 1500 p.s.i. It can deliver 400 million cu. ft/day. S. R. H.

952. New diesels boost capacity of Gulf's State Line station. Anon. *Pipe Line News*, Feb. 1953, **25** (2), 27–8.—A description of the plant layout and operation of a 1170 h.p. diesel engine driving a crude oil booster pump. S. R. H.

953. Boise City station. Description of an automatic unattended products line station. G. P. Jennings and M. E. Worlow. *Pipe Line News*, Sept. 1953, **25** (9), 15–17.—The automatic control of 2 100-h.p. electrically-driven pumps handling 14,000 b.d. is obtained by a telephone dialling system. S. R. H.

954. Compact station design features trunkline system. E. Sterrett. *Pipe Line News*, Oct. 1953, **25** (10), 25–9.—A detailed description of compressors, auxiliaries, and layout of the Longville station of the Trunkline Gas Co. S. R. H.

955. The stress in large diameter gas transmission pipe. J. W. Lodge and G. K. Manning. *Pipe Line News*, Jan. 1953, **25** (1), 24–7.—An experimental study of stress development in buried pipe. S. R. H.

956. Gas turbines drive compressor in El Paso Natural's big expansion programme. Anon. *Pipe Line News*, May 1953, **25** (5), 19–27.—Gas turbines working at low C.R. of 1·10–1·16, and having low cooling water consumption, are used for pumping natural gas. Plant and installation for the 5000-h.p. turbines are described. S. R. H.

957. Natural gas main line tie-in utilizes new technique. Anon. *Pipe Line News*, Oct. 1953, **25** (10), 30–2.—A description of the installation of an orifice fitting in a 22-inch gas line of the Northern Indiana Public Service Co. The time taken from the start of shutdown until full operation again was just over 2 hr. This was achieved by the use of air powered pipe saws for cutting the pipe and a special pipeline safety welding coupling for the tie-in. S. R. H.

958. El Paso Natural's Navajo station. Anon. *Pipe Line News*, Dec. 1953, **25** (12), 25–8.—Details of the 5 gas engine compressors with a combined rating of 3950 h.p., which compress 167 million cu. ft. of gas per day from 500 to 845 p.s.i. Rated at 1000 h.p. each at sea-level, these engines are reduced to 790 h.p. at 6800 ft, the altitude of the Navajo station. S. R. H.

959. Permian gas line project has three stations. Anon. *Pipe Line News*, Dec. 1953, **25** (12), 21–4.—The new gas line built in conjunction with El Paso Natural Gas Co is 285 miles long with a capacity of 400 million cu. ft/day. The 3 stations house 38,000 h.p. in gas compression comprising 14 1320-h.p. engines and 14 1350-h.p. engines. S. R. H.

960. New developments in loading tank cars. W. J. Rodgers. *Petrol. Refin.*, 1954, **33** (1), 151–3.—By loading tank cars through the vent or vapour outlet valve the liq is caused to enter in a spray which increases the absorption of the vapours present, and this, coupled with the refrigerating effect of the pressure drop through the valve, helps to keep the pressure in the tank car down, and so reduces the need for venting the tank, thus reducing vapour losses. R. D. S.

961. Oil tanker *Tina Onassis*. Anon. *Engineer, Lond.*, 1954, **197**, 92–3.—This vessel, which passed her trials in Nov. 1953, is the largest oil tanker propelled by steam turbine machinery yet built. Carrying capacity is 45,000 tons at 16·5 knots. Built at Bremen, cost was a little over £2,500,000. A. C.

962. Patents. U.S.P. 2,654,506 (France 13.9.43; 6.10.53). R. L. Rambert, assr to S. A. T. A. M. Société Anonyme pour Tous Appareillages Mecaniques. Fluid measuring and dispensing apparatus.

U.S.P. 2,654,508 (16.4.49; 6.10.53). F. D. Wright, assr to Fred D. Wright Co. Oil can display rack and cabinet.

U.S.P. 2,655,401 (23.11.48; 13.10.53). C. L. Kelso. Pipe-carrying clamp.

U.S.P. 2,655,946 (2.6.49; 20.10.53). M. P. Morris. Valve for leak patching device for pipelines.

U.S.P. 2,656,262 (28.3.51; 20.10.53). L. V. Larsen, assr to Chicago Bridge and Iron Co. A lifter roof tank having a trough adapted to contain a sealing liq heavier than and immiscible with the tank contents.

U.S.P. 2,656,263 (15.8.50; 20.10.53). L. V. Larsen, assr to Chicago Bridge and Iron Co. Connector for liq storage tanks.

U.S.P. 2,656,725 (26.5.51; 27.10.53). W. N. Kestner, W. C. Kohfeldt, and L. C. Barillier, assrs to Standard Oil Development Co. Automatic sampler for liq hydrocarbon streams.

U.S.P. 2,656,732 (19.10.51; 27.10.53). C. C. Clough. Remote-control mechanism for tank trucks. D. A. R.

U.S.P. 2,657,506 (15.1.52; 3.11.53). R. F. Hadley, J. G. Daugherty, and F. A. Young, assrs to Sun Oil Co. Pipeline cleaning and polishing device.

U.S.P. 2,657,700 (14.11.49; 3.11.53). G. C. Ray, assr to Phillips Petroleum Co. Apparatus for segregating fluids transported by pipeline.

U.S.P. 2,658,360 (8.5.46; 10.11.53). B. Miller, assr to Chemical Foundation Inc. Pipeline transportation of natural gas.

U.S.P. 2,659,209 (23.3.51; 17.11.53). R. V. Phelps, assr to Warren Petroleum Corpn. Underground storage for liq under pressure.

U.S.P. 2,659,913 (7.11.49; 24.11.53). R. C. Baird, assr to Fluor Corpn. Method of stabilizing a pipeline suspended in the air.

U.S.P. 2,660,059 (4.1.50; 24.11.53). M. R. Dean and D. R. de Boisblanc, assrs to Phillips Petroleum Co. Liq level measuring apparatus. J. M. S.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

963. A survey of refinery inspection practices and problems. R. J. Phillips. *Petrol. Refin.*, 1954, **33** (1), 116–18.—The replies to a questionnaire sent to U.S. refineries are classified under the headings of large, medium, and small refineries, and show wide variations in time between shutdowns within each group. The most common problems are the training of qualified personnel, scheduling of work, and combating of corrosion and erosion. R. D. S.

964. The recovery and use of rejected (waste) heat in industry. S. J. Eardley. *J. Inst. Fuel*, Feb. 1954, **27** (157), 67.—A review is presented of the primary and secondary heat requirements of 20 industrial processes. The source, form, and quantity of waste heat and its possible uses are discussed. Appendices give information including detailed calculations of a test on a boiler and generating set where condenser circulating water was used for process, resulting in high overall efficiency. D. K.

965. Bottom-of-the-barrel process. Anon. *Oil Gas J.*, 22.3.54, **52** (46), 124.—7 modern fuel oil-reduction processes are described, including vacuum dist, delayed coking and visbreaking, continuous contact coking, fluid coking, decarbonization, propane decarbonizing, and sulphur dioxide extraction.

Detailed flow sheets are included, with yield tables. G. A. C.

966. Wire mesh aids tower operation. Anon. *Petrol. Process.*, 1954, **9** (2), 227–8.—An installation of a stainless steel wire mesh section for entrainment control inside an asphalt vac tower of Sinclair Refinery Co, Wyoming, has increased tower capacity while still producing an equiv or better quality gas oil and asphalt than was produced at lower feed rates prior to the installation.

The tower in which the mesh is installed is an 8½-ft dia and 48-ft high vessel with internal heat exchangers and gas oil cooler in the upper section. A single wire mesh section, 4 inches thick woven mat, is installed at a point 5 ft below the top bubble tray. This mat covers the whole cross section sectional area of the column, except for the downcomer from the top bubble tray. J. W. H.

967. How to calculate capacities of perforated plates. F. A. Zenz. *Petrol. Refin.*, 1954, **33** (2), 99–102.—The use of perforated plates is now widespread, and this article considers the factors affecting the capacity of a conventional perforated plate fitted with weirs and downcomers. Graphs correlating vapour velocity through the holes, liq depth, froth height, and weepage limit are presented, based on experimental data obtained from an air–water system using several different hole sizes and plate thicknesses. R. D. S.

968. Use these charts to simplify refinery calculations. L. J. Murphy. *Petrol. Refin.*, 1954, **33** (2), 145–8.—Charts are presented for the speedy calculation of tank filling losses, steam flow through orifices, wrinkle-bend lengths, accident severity and frequency rates, pipe schedule numbers, pipe lengths required to encircle cyl tanks, and the amount of electrical energy required to heat refinery pipes under different operating conditions. R. D. S.

969. Automatic sampling of hydrocarbons. W. E. Gibson. *Oil Gas J.*, 1.2.54, **52** (39), 68.—A fully automatic and leak-proof sampling system for hydrocarbons devised by Shell Chemical Corpn is described. Sample is 3800 cc., and over a 7-day period, system is adjustable for longer or shorter sample increments. G. A. C.

970. Switch lamps converted to electric operation. E. B. Brien. *Petrol. Engr*, Sept. 1953, **25** (10), C25.—To minimize fire and explosion conditions, a refinery converted its railroad switch lamps to electric lamps, not only improving the safety but also lowering operation and maintenance costs. G. H. G.

971. Small refinery catalytic cycle stock treating. C. F. Tears. *Petrol. Engr Ref. Annual*, 1953, **25** (9), C12–14.—A small refiner is taken to be one who has a total crude charge capacity of 20,000 b.d. or less. This class of refiner usually pushes the cat cracking unit to its upper capacity limit, and in so doing, frequently has a bottleneck in coke burning capacity or in the limited capacity of gas recovery facilities. One method of alleviating these difficulties is to install a furfural treating unit for the cat cycle stock. A flow chart is given for a unit treating a cycle stock with minimum initial b.p. of 500° F.

This is a low cost method of increasing the crude capacity in a balanced cat cracking operation, while increasing both the % yield of cat gasoline and the overall octane level of the total gasoline production. G. H. G.

972. Refinery manufactures special quench valve. H. M. Martin. *Petrol. Engr*, Aug. 1953, **25** (8), C21–2.—The refinery has a conventional thermal cracker in which reduced crude and gas oil is heated in 4 separate coils before passing to a fractionation system. After leaving the furnace coils, the hot oil stream is reduced in pressure and quenched with cold oil before entering the fractionating towers. Reduction was originally accomplished by means of conventional globe valves, which gave an unsatisfactory chatter of the globe disk, together with general coking up. The new valves are described, and have given excellent service for 3 years with an elimination of the coking problem. G. H. G.

973. Why prestressed concrete in the refinery. J. S. Bell and D. R. Deveaux. *Mech. Engng, N.Y.*, Dec. 1953, **75** (12), 970.—The basic principles of prestressed concrete and the development of constructional technique are outlined. Modern methods of construction of concrete tanks for refinery service are described, and recommendations for linings made. Saving of ⅛ of the steel required for normal steel tanks is claimed. Advantages of prestressed tanks with regard to land-saving adaptability, shock resistance, and fire resistance are discussed. Depending upon local conditions, it is claimed that the annual cost of a 150,000-brl tank shows a saving of 20–30% in favour of the prestressed concrete tank. Breathing losses from gasoline storage tanks could be reduced considerably by the use of prestressed tanks capable of withstanding an internal pressure of 2½–3 p.s.i. Disadvantages of this type of tank include lack of versatility, and difficulties of construction and repair. Other refinery applications are discussed. 23 refs. T. T.

974. Designing stripping columns. N. H. Prater. *Petrol. Refin.*, 1954, **33** (2), 96–8.—The number of trays used in stripping columns for controlling flash, visc, and gravity of petroleum fractions can be estimated graphically by breaking down the true b.p. curve of the fraction into a series of hypothetical pure compounds, the properties of which can be determined and used to draw the vapour-liq equilibrium curve and the operating line. A worked example of the method is given. R. D. S.

975. Heat transfer. B. E. Lauer. *Oil Gas J.*, 2.11.53, **52** (26), 135.—This is the final instalment of the series, and concludes with coeff of heat transfer through film between inside surface of hot duct and jacket of jacketed vessel and liq. G. A. C.

976. Chemical engineering—Pt IV. Transfer of heat. D. C. Freshwater. *Inst. Petrol. Rev.*, 1953, **7** (83), 369–77.—Nearly all the important refinery processes in the petroleum industry involve transfer of heat, *e.g.* dist, cracking, condensation of vapours, dewaxing of lub oils. In order to achieve thermal economy, it is essential that the supply and removal of heat

should be most carefully controlled, and that the laws governing these processes should be thoroughly understood. The qualitative and mathematically quantitative explanations of conduction, convection, and radiation, the 3 processes which singly, or in conjunction with one another, are responsible for heat transfer, are discussed. 3 kinds of heat exchangers are described in turn, namely shell tube, concentric, and coil-in-bath type. Alternatively, heat exchangers may be classified in terms of the type of duty for which they are used. Mention is made of feed preheaters and air or gas preheaters which are commonly used. Finally, condensers and reboilers, which are special types of heat exchangers, are described in detail.
R. H.

977. Heat transfer in a continuous reheating furnace. R. J. Sarjant and D. Smith. *J. Inst. Fuel*, Jan. 1954, **27** (156), 16.—The first stage of a systematic experimental investigation into the thermal factors of furnace design is described. The design of the furnace, procedure used, and results obtained are discussed.
D. K.

978. New ideas on chamber coking at NCRA. J. W. Ward and J. M. Holocek. *Petrol. Refin.*, 1954, **33** (2), 157–9.—The low pressure chamber-type coking unit at the McPherson, Kansas, refinery of NCRA was designed to yield the max cat cracking charge stock with as little gasoline and coke as possible. Capital cost was kept down by utilizing existing visbreaking equipment. 9000-b.d. reduced crude is charged direct to the coking heater without recycle and the chambers are decoked hydraulically with water at 1400 p.s.i. The day's coke yield of 225 tons is handled by means of a gantry crane.
R. D. S.

979. Chemical engineering—Pt V. Refrigeration. D. C. Freshwater. *Inst. Petrol. Rev.*, 1953, **7** (84), 407–12.—Refrigeration in which a material is cooled to a temp below that of the atmosphere or of the available cooling water, is a comparatively new process, but has diverse applications in the refining of petroleum products. The process consists essentially of removing heat from the fluid to be cooled, and passing it on to another fluid, usually the atmosphere. Mechanical refrigeration systems can be divided into 2 main types—compression systems and absorption systems. In the former energy in the form of work is put into the system by a pump. Different types of compression machines, refrigerants, and compressors to be used in this system are all discussed. Details of the absorptive process are also given. A third system, evaporation water cooling, is also mentioned. Applications of refrigeration in practice are discussed. The main ones are dewaxing, recovery of cracking gas, the Edeleanu process (for aromatic extraction), and various chemical processes.
R. H.

980. Treating cooling-tower lumber. R. H. Bescher. *Oil Gas J.*, 11.1.54, **52** (37), 82.—Delignification, leaching action, chemical attack, and fungal decay are examined as causes for early replacement of wooden parts of cooling towers. Pressure impregnation with creosote increases life of wood; and a cost comparison of pressure *vs* untreated wood towers is given.
G. A. C.

981. What's new in cooling-tower wood maintenance? C. L. Blohm, M. Tarplee, and E. C. Smith. *Oil Gas J.*, 11.1.54, **52** (36), 78.—A summary of studies made on 103 cooling towers in the Gulf Coast is given. Results show that: (1) proper water treatment can prevent excessive deterioration and running infection; (2) prevalence of decay is not sufficient to warrant use of treated timber; (3) high operating temp intensify surface attack; (4) control of pH and water inlet temp within reasonable limits results in nominal loss of wood from all types of deterioration.
G. A. C.

982. Cooling tower wood deterioration. Anon. *Petrol. Process.*, 1954, **9** (2), 211–15.—The causes of cooling tower wood deterioration are outlined, and suggested remedies, such as correct chemical treatment of circulating water and careful control of operating temp, are proposed. Photographs are presented showing different types of attack.
J. W. H.

983. Chemical engineering—Pt III. Furnaces. D. C. Freshwater. *Inst. Petrol. Rev.*, 1953, **7** (82), 332–7.—In furnaces, most of the heat transfer occurs by radiation. The most important examples in the oil refinery are the direct-fired tubular furnaces used in atmospheric and vacuum dist, thermal cracking, and modern high-temp gas processing. Such furnaces handle materials at temp of from 350° to 500° C. The present day pipe still and its predecessors are described and various factors discussed. These include the methods of supplying heat, the steady supply of fuel oil to the burners, the operation of the burners themselves, the combustion space, combustion air, and the removals of waste gases. General notes are included upon the construction and operation of tube stills.
R. H.

984. Hydrocyclones for recovery or separation of solid particles. F. J. Fontein. *Ingenieur, 's Grav.*, 30.10.53, **65** (44), 101–7.—A concise explanation of the operating principles of a hydrocyclone is given, stressing its special possibilities as a means of separating spherical from flat particles. The special effects resulting from the high shearing forces encountered in a hydrocyclone are discussed. Strong emphasis is laid upon the advantages of arranging a large number of small cyclones in batteries. In one example cited, 264 cyclones of 15 mm dia are arranged in a 3-stage unit having a flow capacity of 75 g.p.m. at 112 p.s.i. pressure drop. A centrifugal acceleration of 25,000 G is obtained. 13 figs are included, dealing mostly with applications in the foodstuffs industry.
G. F. T. C.

985. Development of the petroleum refining industry in Poland. L. Zurkowski. *Nafta (Krakow)*, 1953, **9**, 214–17.—After reviewing the previous development of industry, the author sums up by stating that at present solvent refining is done only to the extent of 30% of plan, and the newest refinery is still only half finished. It seems improbable that by 1955 the 6-year plan will be completed, but instead of importing finished products to satisfy consumption, which by 1960 will rise by 160% over 1955, another new refinery should be built (sixth in Poland) including cracking equipment to produce high octane spirit. Ethyl and methyl alcohols, as well as benzol, will still be needed, since fuels will form four fifths of petroleum products required in 1960.
M. S.

986. Pernis, Rotterdam. V. S. Swaminathan. *Petrol. Process.*, 1954, **9** (2), 218–20.—The recent completion of a fourth crude distn unit at Pernis, Rotterdam, refinery of Royal Dutch-Shell, with a capacity of 65,000 b.d., makes this refinery the largest in Europe with a total capacity of 180,000 b.d. The refinery has also in operation the first fluid cat cracking unit to be erected in Europe with a capacity of 29,250 b.d.
J. W. H.

987. Pump problems from the operators viewpoint. B. Waeser. *Erdöl u. Kohle*, 1953, **6**, 795–9.—Review, under the following heads: design; selection, location, and drive; materials of construction; pump operation; new types of pumps; air pressure and jet pumps. 50 refs.
V. B.

988. Patents. U.S.P. 2,655,437 (2.6.50; 13.10.53). P. W. Garbo, assr to Hydrocarbon Research Inc. Fluidized solids reactor.

U.S.P. 2,656,242 (27.6.52; 20.10.53). G. L. Matheson, assr to Standard Oil Development Co. Apparatus and process for handling fluidized solids.

U.S.P. 2,656,258 (18.4.45; 20.10.53). F. L. Symonds, assr to Standard Oil Co. Reaction furnace for contacting a gas and fluidized solids.
D. A. R.

U.S.P. 2,657,753 (6.9.49; 3.11.53). P. G. Carpenter, assr to Phillips Petroleum Co. Tool for impinging liq against inner walls of chambers.

U.S.P. 2,658,025 (14.11.49; 3.11.53). E. R. Williams, assr to Shropshire–O'Niell Tank Co. Oil treating apparatus having settling tank heating means.

U.S.P. 2,658,031 (10.3.51; 3.11.53). A. H. Schutte, assr to Lummus Co. Coking apparatus.

U.S.P. 2,659,452 (28.2.51; 17.11.53). A. Gaydasch, assr to Universal Oil Products Co. Condensate trap.

U.S.P. 2,659,916 (7.10.48; 24.11.53). C. A. Lewis, assr to C. A. Lewis Inc. Coke remover for tar and petroleum stills.

U.S.P. 2,660,235 (24.7.47; 24.11.53). W. S. Patterson, assr to Combustion Engineering Inc. Burner for converting natural gas into gasoline components. J. M. S.

Ger.P. 899,795, 5.11.53. Kaufmann and Kolbe, assrs to Farbwerke Hoechst AG formerly Meister Lucius & Brüning, Frankfurt-(M.).—Hoechst. Device for heat exchange.

Ger.P. 899,946, 5.11.53. Breitbach, assr to Borsig AG, Berlin-Tegel. Heat exchanger with horizontal tube banks and cascade overflow. (Addn. to Pat. 868,746).

Ger.P. 899,992, 5.11.53. Seibel, assr to Bergische Stahlindustrie, Remscheid. Reversible elbow with stopper closure for tube furnaces, *e.g.* dist and cracking furnaces for petroleum industry.

Ger.P. 900,350, 12.11.53. Kögel and Widell, assrs to AB Elektrolux, Stockholm. Method for operating intermittent heat transfer systems.

Ger.P. 901,421, 26.11.53. Bachl, Erlangen. Plant for heat exchange between 2 material mixtures and for simultaneously separating or mixing the single components.

Ger.P. 901,541, 26.11.53. Lindner, München. Heat exchanger.

Ger.P. 901,442, 26.11.53. Schmidt and Baumbach, assrs to Chem. Werke Hüls G.m.b.H., Marl (kr Recklinghausen). Graphite heat exchanger.
BrennstChemie, 1953, **34**, (23–24). R. T.

DISTILLATION

989. Calculation of fractionating columns with allowance for fugacity. B. Riediger. *Erdöl u. Kohle*, 1954, **7**, 21–7.—Separation of low mol. wt. hydrocarbons under pressure gives rise to conditions in which the vapour phase deviates significantly from the ideal gas laws. Expressions previously derived (*cf.* Abs. **2331**, 1951) have been elaborated to cover boiling point, dew point, and equilibrium calculations for such cases. Tables (separately published) have been compiled, over the range −100° to +100° C and 2–50 atm, for C_1–C_5 *n*-paraffins, *iso*butane, 2-methylbutane, C_2–C_4 olefins. V. B.

990. Use of wire-mesh sections in asphalt entrainment control in vacuum pipe stills. G. Weber, J. S. Corlew, A. R. Orr, H. S. Fourer, and D. H. Stormont. *Oil Gas J.*, 2.11.53, **52** (26), 82.—The sections consist of layers of fine knitted wire of a suitable metal alloy, supported on knife-edged members, properly spaced to allow for a straight-line upward flow of vapour through mesh.

Over 99% of entrained liq droplets in vapours impinge on the wire, coalesce into large drops, and drain free from mesh section. 4 case histories are given. G. A. C.

991. Patents. U.S.P. 2,658,061 (22.9.49; 3.11.53). J. S. Tripp, L. H. Brakel, and G. D. Gould, assrs to U.S.A. (Secretary of the Interior) and California Research Corpn. Retort for destructive dist of oil shale.

U.S.P. 2,658,737 (10.3.50; 10.11.53). I. E. Nutter. Apparatus for controlling flow in bubble towers.

U.S.P. 2,658,738 (4.1.52; 10.11.53). G. W. Plossl and F. E. Neef, assrs to Gilbert and Barker Manufacturing Co. Holding device for bubble caps.

U.S.P. 2,658,863 (15.7.52; 10.11.53). J. R. Guala, assr to Gulf Oil Corpn. Vacuum fractionation process. J. M. S.

ABSORPTION AND ADSORPTION

992. Patents. U.S.P. 2,659,453 (20.12.48; 17.11.53). S. P. Robinson, assr to Phillips Petroleum Co. Acetylene is separated from gaseous mixtures by contacting with an aq soln of glycolonitrile acidified with a non-volatile mineral acid to a pH of 2·5–3.

U.S.P. 2,660,262 (19.7.50; 24.11.53). E. W. S. Nicholson, assr to Standard Oil Development Co. In an adsorption–desorption process for separating the components of a mixture, 30–60% of the denuded adsorbent is heated in a re-activation zone by direct contact with hot combustion gases and returned to the desorption zone to supply at least part of the heat necessary for the desorption. J. M. S.

Ger.P. 899,991, 5.11.53. Bratzler, Rüping, Siebert, and Vollmer, assrs to Lurgi Ges. für Wärmetech. m.b.H., Frankfurt (M.). Process and installation for adsorption operations, *e.g.* for obtaining a liq product rich in liquefiable hydrocarbons.
BrennstChemie, 1953, **34**, (23–24). R. T.

SOLVENT EXTRACTION AND DEWAXING

993. Economics of making high purity aromatics. W. K. Jackson, C. K. Chadd, and D. M. Krausse. *Petrol. Process.*, 1954, **9** (2), 233–7.—This article describes the economic aspects of the operation of the Udex solvent extraction process, and also discusses the new problems resulting from meeting American purity requirements. The extraction tower unit under consideration was designed for a feed rate of 1600 b.d. of reformate from a UOP platformer containing 50% aromatics. J. W. H.

994. Aromatics by SO_2 extraction. W. F. Wilkinson, J. R. Ghublikian, and P. Obergfell. *Petrol. Engr Ref. Annual*, 1953, **25** (9), C3–6.—Liquid SO_2 is particularly suitable as a solvent for the recovery of aromatics. The present interest in the production of high purity aromatics by the improved cat reforming process has suggested a review of the SO_2 extraction process for the separation of aromatics. Tables show typical treating conditions for several different boiling range stocks, utilities required, the investment and operating costs.

A modified process overcomes the limitations of straight SO_2 extraction, namely the aromatic concn attainable. It involves the use of a hydrocarbon fraction of essentially paraffinic character, having a boiling range different from that of the charge oil, to further enrich the extract soln obtained by conventional SO_2 extraction. A flow diagram of the plant is given. The process has proved successful on cat reformed or cracked dist at low operating and maintenance costs. G. H. G.

995. Patents. U.S.P. 2,657,761 (12.6.50; 3.11.53). M. R. Cines, assr to Phillips Petroleum Co. Perfluoroamines are used for extracting ethane from hydrocarbon mixtures.

U.S.P. 2,658,852 (20.7.50; 10.11.53). J. L. Tiedje and J. B. McGrath, assrs to Standard Oil Development Co. Low m.p. plastic waxes are made by pressing a foots oil derived from a light, waxy lub oil dist at *ca* 80° F, blending the pressed foots oil with a heavy waxy lub oil dist, dewaxing the blend, de-oiling the wax cake obtained, and fractionating the de-oiled cake to obtain a low m.p. plastic wax.

U.S.P. 2,658,853 (29.6.51; 10.11.53). E. W. Clarke, assr to Atlantic Refining Co. Wax-containing mixtures are separated into fractions of different m.p. by extracting the mixture with 2·9–3·1 vol phenol containing 0·2–0·4 vol water per vol of mixture at a temp such as to cause the formation of 2 immiscible liq phases, separating the phases, adding water to each phase so as to form a solid and liq phase, separating the solid from the liq phases, and removing phenol and water from each fraction.

U.S.P. 2,658,854 (1.10.51; 10.11.53). H. C. Myers and A. O. Pukkila, assrs to Socony-Vacuum Oil Co. Hydro-

carbon fractions are dewaxed by adding an aliphatic diol or triol which is liq at the dewaxing temp, sol in the oil and wax, and is a good solvent for the surface active agent used in the process, agitating the mixture in the presence of a surface active agent which is an alkali metal salt of an alkarylsulphonic acid or of an alkyl hydroxyarylsulphonic acid, to produce a dispersion of the diol or triol in the hydrocarbon fraction, cooling to the dewaxing temp to associate wax with the dispersed phase and separating the dispersed phase.

U.S.P. 2,658,855 (27.6.51; 10.11.53). G. L. Payne, assr to Socony-Vacuum Oil Co. De-oiling wax by continuously contacting an oily wax charge with a countercurrently moving adsorbent belt below the m.p. of the wax and continuously pressing the wax on the belt by passing the belt around a revolving roller surface. This is repeated until the wax has been de-oiled to the necessary extent. The oil adsorbed in the belt is washed out with an oil solvent and the belt continuously dried for further use.

U.S.P. 2,659,664 (30.8.50; 17.11.53). W. R. Works and F. A. M. Back. Vortex ring process for liq–liq extraction. J. M. S.

Ger.P. 901,096, 19.11.53. Engel and Göhre, assrs to BASF. Process for dewaxing oils. *BrennstChemie*, 1953, **34**, (23–24). R. T.

CRACKING

996. The present status of the art of cracking petroleum fractions. W. C. Dickerman, Jr. *J. Inst. Petrol.*, 1953, **39**, 765–88.—The increase in consumption of petroleum products in the period 1921–51 is shown for the U.S.A. and for Britain, and the changing proportions of motor spirit and fuel oil are pointed out. The development of thermal cracking and later, cat, as a means of meeting these changed product requirements is discussed, and outlines of the various commercial cracking and reforming processes are given. A. R. W. B.

997. Sinclair's new 40,000-brl F.C.C. unit. F. L. Resen. *Oil Gas J.*, 8.2.54, **52** (40), 80.—The new plant has the following features: (1) a sectionalized stripping section in the reactor; (2) a new bed-level control arrangement in the reactor; (3) a novel support for the regenerator grid; (4) a CO boiler and regenerator superheated; (5) a compact reactor–regenerator set-up; and (6) layout provisions to simplify maintenance. A simplified flow sheet is provided. G. A. C.

998. CO boiler, fluidized-bed steam superheater—feature Sinclair F.C.C. plant. O. F. Campbell and N. E. Pennels. *Oil Gas J.*, 22.2.54, **52** (42), 132.—The installation at Sinclair's Houston refinery of a combination CO boiler and respray steam superheater allows for max flexibility of operation of a fluid unit to produce greater volume and better quality products with max conservation of fuel.

The unit is independent of outside sources of steam and energy during start-up, in operation, or shutdown. The steam production is under complete control of operators, and can be produced at high pressure and temp, which decreases requirements per h.p. for fluid unit prime movers. All combustibles in the flue gas are burned in the unit, hence CO gas is prevented from escaping and polluting atmosphere. Cost of boiler and ancillaries is no greater than that of a fired boiler of same output. G. A. C.

999. Put the automatic computer to work. F. M. Orr. *Oil Gas J.*, 1.3.54, **52** (43), 87.—Article describes how Humble Oil and Refining Co used the computer for calculating flow on a number of streams during fluid cat cracking unit tests at their Baytown refinery. Tables show equations used in calculating meter coeff for flange tap installations, typical listing for gas and liq meters, and results from calculating carbon burning rate. G. A. C.

1000. Space velocity and catalyst–to oil ratio together provide a measure of cracking severity. J. W. Moorman. *Oil Gas J.*, 8.3.54, **52** (44), 106.—This fourth article on cat cracker operation deals with the weight or volume basis in fluid and moving-bed units, effect of changing space velocity on corrosion, and of changing C/O ratio on coke yield, and shows how severity factor can be used for correlating severity conditions. G. A. C.

1001. Why did regenerator-standpipe get shorter when it got hot? D. J. Bergman. *Oil Gas J.*, 22.2.24, **52** (42), 173.—A cat pipe shortened as it became hot, which was found to be due to temp differential across the steel wall. Problem was solved by application of inside or outside insulation, which reduces the temp differential. G. A. C.

1002. Houdriforming economics—effect of feed-stock boiling range and reforming severity. H. D. Noll, T. A. Burtis, and J. C. Dart. *Petrol. Engr Ref. Annual*, 1953, **25** (9), C15.—The paper summarizes the results of work on the selection of charge stocks for Houdriforming, from the standpoint of what naphtha cut to be reformed, and to what severity. Study is based on the processing of 5000 b.d. of a full-range naphtha of low sulphur content. From this full-range naphtha, 3 Houdriforming charge stocks were prepared, comprising fractions 205°–400°, 250°–400°, and 300°–400° F. Each fraction was Houdriformed at several conditions to give C_4-free reformates with an O.N. of 75–95.

The conclusions reached were: (1) 86 O.N. is made at the least cost by reforming the narrower-boiling heavy naphtha; (2) the most economical operation is not represented by max reforming severity; (3) it is most desirable to accomplish the upgrading of a full-range naphtha by reforming the lowest octane fraction which will give the required final quality; (4) max earnings are obtained from the narrower-boiling heavy charge stock reformed to a moderate O.N. G. H. G.

1003. Synthetic fluid cracking catalysts. C. O. Brown and R. B. Wainwright. *Petrol. Engr Ref. Annual*, 1953, **25** (9), C37.—Discussion of some of the most important factors relating to the utilization of fluid cracking cat. The need for careful definition of cat usage in keeping with the operating objectives and the demands being made on the cracking unit is stressed. There are several factors influencing cat utilization: (1) selection of the cat particle size—bearing on fluidization and circulation, bed concn, or density cat losses; (2) operating conditions under which the cat is used; (3) cat manufacture; (4) unit design. It is thought that greater utilization of the cat should result in the future. G. H. G.

1004. Design and operation of orthoflow units. W. J. Degnen and J. F. Skelly. *Petrol. Engr Ref. Annual*, 1953, **25** (9), C7–10.—The orthoflow fluid cat cracking unit is a new arrangement of the major components in the fluid cat process for cracking gas oil to gasoline. Innovations are principally concerned with the means of cat circulation, giving a unit with lower initial cost, improved operability, and reduced maintenance. The mechanical design and operation of the unit is described.

It is estimated that the savings arising from the orthoflow concept alone amount to about 5% of the total erected cost, when compared with a balanced pressure unit built to the same mechanical specification. Based solely on the cat cracking section, the orthoflow unit is 15% cheaper to design and erect. G. H. G.

1005. Patents. U.S.P. 2,654,694 (17.10.51; 6.10.53). C. V. Berger and D. D. Hansen, assrs to Universal Oil Products Co. Non-regenerative cat reforming process.

U.S.P. 2,655,484 (4.1.50; 13.10.53). J. L. Groebe, assr to Phillips Petroleum Co. Refortification of aluminium halide–hydrocarbon complex cat.

U.S.P. 2,657,121 (3.10.46; 27.10.53). J. F. Rollins, assr to Lummus Co. Cat reactor. D. A. R.

HYDROGENATION

1006. Hydrogenation of propylene on solid catalysts. F. Runge, O. Bankowski, and G. Hoffmann. *BrennstChemie*, 1953, **34** (21–22), 330–3.—Studies of propylene hydrogenation in the gas phase, including thermodynamics of the reaction and experiments with H_3PO_4, montmorillonite, and WO_3 cat are reported. In gas phase hydrogenation yields and alcohol concn in the product are equal to those obtained in the H_2SO_4 process. Provided that the most active WO_3 cat have an adequate life period, the simpler—as regards apparatus—gas phase process may be superior to the H_2SO_4 process. R. T.

1007. Patent. Ger.P. 900,214, 12.11.53. Frese and Schirrmacher, assrs to Ruhröl G.m.b.H., Bottrop. Process for foreign gas separation from cycle gas of cat high-pressure hydrogenation.
BrennstChemie, 1953, **34** (23–24). R. T.

POLYMERIZATION

1008. Contribution to knowledge of chemical structure of polymerization products of low-molecular weight olefins with phosphoric acid. E. Terres. *BrennstChemie*, 1953, **34** (23–24), 355–8.—Theories of propylene polymerization over phosphoric acid cat are discussed by reference to ionic mechanisms, with relevant formulæ. Polymerization over HPO_3 at 160°–170° C and 50–60 atm, and fine fractionation of the polymerizate for separation of individual polymers are described and discussed. Position of double bond and arrangement of CH_3 side chains are determined by oxidative cracking of the fractions with performic acid, lead tetra-acetate, or ozone, and identification of the cracked products. R. T.

ALKYLATION

1009. HF alkylation—the process and its control. J. E. Hewson. *Oil Gas J.*, 22.3.54, **52** (46), 189.—A typical HF-alkylation process is described, including charge stock preparation, contacting and settling, defluorination operations, cat regeneration, vessels, and piping. A chart shows typical instrumentation of an HF-alkylation unit. G. A. C.

1010. Patents. U.S.P. 2,655,544 (29.12.45; 13.10.53). G. M. McNulty and T. Cross, assrs to Standard Oil Development Co. Alkylation of phenols with polypropylene.

U.S.P. 2,655,547 (2.6.52; 13.10.53). F. Bryner, assr to Dow Chemical Co. A process for the production of *tert*-butylphenol compounds containing a large proportion of the ortho isomer which comprises bringing one mol proportion of *iso*butylene into contact with more than one mol proportion of a phenol containing not more than one nuclear substituent ortho to the hydroxy group, in the presence of 0·1–10% by wt of phosphorus oxychloride cat based on the weight of the phenol, at a temp in the range of 30°–200° C for a time sufficient to effect substantially complete reaction, and recovering the ortho-*tert*-butylphenol compound so produced. D. A. R.

ISOMERIZATION

1011. Patents. U.S.P. 2,656,397 (8.3.52; 20.10.53). G. Holzman and G. M. Good, assrs to Shell Development Co. Isomerization and separation of xylenes. D. A. R.

U.S.P. 2,659,762 (24.7.52; 17.11.53). A. P. Lien and D. A. McCaulay, assrs to Standard Oil Co. Tetramethylbenzene isomers are isomerized to *iso*durene by contacting with 0·9–3 mol BF_3 per mol of tetramethylbenzene and with sufficient liq HF to dissolve both materials at 20°–100° C. J. M. S.

CHEMICAL AND PHYSICAL REFINING

1012. Factors affecting percolation yields. E. J. Reeves. *Petrol. Engr*, July 1953, **25** (7), C23–4.—Percolation is a common method for the decolorization of lub oils. Primary consideration in operation of the process is the yield of decolorized oil, vol oil/vol adsorbent. For a given oil, the most important factors affecting these percolation yields are: (1) type of adsorbent; (2) efficiency of average adsorbent; (3) regeneration equipment.

Evaluation of Attapulgus clay and bauxite, using many different lub oil stocks, indicated that yields from bauxite percolations are equal or superior to those from Attapulgus clay. Percolation yields are low if a high volatile clay is employed. Regeneration conditions should be adjusted to give a clay with a volatile matter below 5% wt. G. H. G.

1013. Chemical refining of benzene. F. Sager and F. Palmqvist. *Erdöl u. Kohle*, 1953, **6**, 783–7.—Layout of continuous benzene refining plant, using centrifuges. Preliminary NaOH treat (to remove phenols and some mercaptans) followed by 2-stage countercurrent H_2SO_4, neutralization, and water-washing. Lab procedure, reproducing plant conditions, is described, pilot-plant is as previously used for gasoline (*cf.* Abs. **996**, 1938). Results, showing effect of reaction time and temp, given on cat cracker and coal-tar benzenes; using 9 wt % 98% H_2SO_4, 8 min, and 32° C (initial) are suitable values for former. If CS_2 is present this can be removed by adaption to continuous working of MeOH–NaOH treatment. V. B.

1014. Sweetening gasolines. C. R. Wagner. *Petrol. Engr*, July 1953, **25** (7), C17.—A summary of the different methods now in common use for sweetening gasolines is given. If one of the processes will give a satisfactory product from the odour standpoint, it is definitely better to use than to try complete sweetening. G. H. G.

1015. Froth flotation of low-rank coals. J. A. E. Allum and P. F. Whelan. *J. Inst. Fuel*, March 1954, **27** (158), 42.—Investigations are described which were made in the laboratory to ascertain what methods would be effective in overcoming excessive reagent consumption during froth flotation of coal. A 2-stage conditioning scheme, in which agitation with a cheap auxiliary oil, such as medium fuel oil, precedes the addition of the frother, *e.g.* cresylic acid, showed reduction in reagent cost by 50% or more, and may permit economical cleaning of low rank coals. D. K.

1016. Patents. U.S.P. 2,654,659 (18.12.47; 6.10.53). A. H. Friedman, assr to Phillips Petroleum Co. Apparatus for the synthesis of hydrocarbons by contacting synthesis gas mixtures comprising carbon monoxide and hydrogen with a finely divided cat which comprises a special distribution device for inlet gas.

U.S.P. 2,655,463 (30.11.50; 13.10.53). A. E. Hoffman, assr to Universal Oil Products Co. A process for desulphurizing hydrocarbons which comprises treating the hydrocarbons with a soln of hydrogen fluoride in a chlorofluoro-hydrocarbon at a temp of from *ca* 50° to *ca* 200° F and at a pressure of from *ca* 100 to *ca* 500 p.s.i.

U.S.P. 2,655,468 (10.3.51; 13.10.53). R. L. Greene, assr to Standard Oil Development Co. Recovering solvent from process steam in the extraction of lub oil stocks.

U.S.P. 2,655,469 (31.5.51; 13.10.53). A. Manteuffel, G. R. Cook, and W. D. Gilson, assrs to Pure Oil Co. Method of removing active sulphur from sulphurized organic compounds.

U.S.P. 2,656,302 (G.B. 20.9.50; 20.10.53). F. W. B. Porter and J. N. Haresnape, assrs to Anglo-Iranian Oil Co. A continuous process for the hydrocatalytic desulphurization of a sulphur-and-naphthene-containing hydrocarbon oil.

U.S.P. 2,656,430 (28.2.51; 20.3.53). R. E. MacPherson and O. Schricker, assrs to Standard Oil Development Co. A method of hydroforming naphtha containing a substantial amount of naphthenic hydrocarbons.

U.S.P. 2,656,311 (31.10.49; 20.10.53). D. R. Stevens and S. C. Camp, assrs to Gulf Research and Development Co. A method of inhibiting the de-alkylation of crude acidic alkylated phenols at elevated temp which comprises adding to the alkyl-

ated phenols and maintaining therein at least 1·5 times the stoichiometric quantity of an alkali metal phenate necessary to neutralize the extraneous non-phenolic acidic matter in the alkylated phenols.

U.S.P. 2,656,342 (8.7.49; 20.10.53). C. N. Kimberlin and W. F. Arey, assrs to Standard Oil Development Co. Hydrocarbon segregation utilizing urea and a nitrile.

U.S.P. 2,656,896 (11.1.50; 27.10.53). C. O. Glasgow, assr to National Tank Co. A fluid separator for degassing oil and including an elongate horizontal tank having an inlet at one end and a liq outlet at its opposite end.

U.S.P. 2,657,175 (16.11.50; 27.10.53). R. B. Mason, assr to Standard Oil Development Co. Desulphurization of heavy petroleum oils.

U.S.P. 2,657,227 (16.10.47; 27.10.53). R. M. Burgison, S. E. Forman, and D. G. Zink, assrs to National Distillers Products Corpn. Removal of oxygenated organic compounds from hydrocarbons. D. A. R.

U.S.P. 2,658,027 (3.12.51; 3.11.53). C. O. Hoover, assr to Air Reduction Co. Acid constituents of pet dist are neutralized by passing the vaporized dist over an alkali metal organic acid soap.

U.S.P. 2,658,060 (30.11.49; 3.11.53). G. B. Arnold and L. Kovach, assrs to Texas Co. Centrifugal separation of urea complexes.

U.S.P. 2,658,887 (11.2.50; 10.11.53). G. B. Arnold, J. K. Truitt, and H. V. Hess, assrs to Texas Co. Urea complexes with hydrocarbons are made in the presence of an added complex of urea and an aliphatic hydrocarbon containing a straight chain of at least 6 carbon atoms.

U.S.P. 2,659,691 (15.12.49; 17.11.53). A. Gislon and J. Quiquerez, assrs to S. A. Compagnie Française de Raffinage. Refining pet products by oxidizing mercaptans therein by the action of oxygen in the presence of organic–chelate compounds that have the property of absorbing oxygen from air and releasing it in a pure state.

U.S.P. 2,659,763 (16.9.50; 17.11.53). R. L. Humphreys, G. C. Brock, and C. K. Reynolds, assrs to California Research Corpn. *p*-Xylene is separated from its isomers by crystallization, 0·01–5 vol % of an alcohol of 1–4 carbon atoms, a ketone of 3–4 carbon atoms, or an aldehyde of 1–4 carbon atoms being added to the mixture before separating the *p*-xylene crystals from the mother liquor.

U.S.P. 2,660,600 (30.3.49; 24.11.53). N. J. Bowman, assr to Standard Oil Co. Hydrocarbon oils containing oxygenated compounds are refined by heating in the liq phase at 100°–300° C in the presence of an anhydrous oxide of calcium, strontium, or barium, and separating the sludge. J. M. S.

Ger.P. 900,571, 12.11.53. Büsching, Traunstein. Method for recovering H_2SO_4 suitable for high concn from waste acids from refining of pet, brown coal tar, and coal tar oils, also H_2SO_4 wastes contaminated with org substances.

Ger.P. 900,985, 19.11.53. Grimme and Koch, assrs to Rheinpreussen AG für Bergbau und Chemie, Homberg. Process for purifying aliphatic hydrocarbons.
BrennstChemie, 1953, **34** (23–24). R. T.

SPECIAL PROCESSES

1017. Canada makes phenol, acetone from cumene. H. C. Plummer. *Petrol. Engr*, Sept. 1953, **25** (10), C27.—A new plant, for the production of phenol and acetone from petroleum through the oxidn of cumene, has an annual capacity of 13,000,000 lb phenol and 8,000,000 lb acetone, with several by-products. The open construction to avoid undue vapour concentrations has the disadvantage in the amount of steam piping required. The unit, as operating, consists of feed preparation, cumene, and a cat polymerization unit. The process is described in detail. The cumene unit is so designed that it could produce propylene tetramer, used as the foundation for the production of detergent base. Cat in the cumene and cat polymerization reactors is a phosphoric acid type in pellet form. As there are a number of products formed in the process, a suitable fractionation system is required to produce phenol and acetone of suitable purity. A number of columns are used, varying in ht from 50 to 100 ft. G. H. G.

1018. Catalytic polyforming of gas oil. L. Berg, L. G. Mayfield, H. A. Saner, W. F. Polich, B. A. Ennenga, R. B. Hamilton, L. D. Lewallen, and R. L. Crecelius. *Petrol. Engr*, Sept. 1953, **25** (10), C7.—Cat polyforming incorporates the advantages of the thermal polyforming and cat cracking processes. Fixed-bed cat cracking is carried out in the presence of added outside hydrocarbon gases and gas mixtures. The purpose of the present work was to investigate the major variables to ascertain what advantages might be gained by cat polyforming. Outside gases studied were propane, *n*-butane, *iso*butane, *iso*butylene, and paraffin–olefin mixtures. Pressures up to 2000 p.s.i.g. and mol. ratios of gas to oil up to 15 were used, with a number of cat, the space velocity varying over a range 0·5–5. The equipment and methods are given.

Tables are shown for the results of the effects of the different variables, which may be summarized as follows: (1) the Houdry synthetic aluminium–silicate cracking cat appears to be the most effective of those tested; (2) gasoline in higher yield and O.N. than that from cat cracking is obtained with cat polyforming when an olefin or mixed olefin–paraffin gas mixture is employed; (3) using a paraffin–olefin gas mixture similar in composition to a C_3–C_4 refinery cracked gas, gasoline yield and O.N. exceeding the conventional cat cracked product can be obtained at 300–2000 p.s.i.g. and mol. ratios of gas to oil of *ca* 10 in the cat polyforming operation. G. H. G.

1019. Autofining: a new process for catalytic desulphurization. F. W. B. Porter. *J. Inst. Petrol.*, 1954, **40**, 18–30.—Autohydrofining is a cat desulphurization process for petroleum dist which has been applied to feedstocks up to the end of the gas oil boiling range (*ca* 360° C). Hydrogen required for the elimination of S as H_2S is provided by the dehydrogenation of naphthenes present in the feedstock. Details of development work on this process and a description of the commercial unit are given. A. R. W. B.

1020. DMF—acetylene recovery solvent. W. B. Howard, E. P. Schoch, and F. R. Mayforth. *Petrol. Refin.*, 1954, **33** (1), 143–6.—All present processes for the production of acetylene from natural gas and other natural hydrocarbons produce a gas containing 5–15% acetylene. Experimental work on pilot plant scale reported here shows that dimethyl formamide is a highly efficient solvent for concentrating acetylene from these mixtures, giving a 38-fold enrichment of acetylene over carbon dioxide from the feed to final product. Corrosion tests indicate that mild steel is a suitable material of construction for most of the DMF system. R. D. S.

1021. A look at round 2 of NH_3 expansion. J. C. Reid. *Oil Gas J.*, 8.3.54, **52** (44), 86.—This is the last of a series of articles to present an up-to-date picture of the ammonia programme. Tables show ammonia plant construction 1953–54 (listing 8 plants) and economies of Kellogg ammonia process for various feeds and capacities.

A process scheme is described for nitrogen products plant involving steam–methane reforming at elevated pressure, a near-isothermal ammonia converter, and Monticatini urea manufacture. G. A. C.

1022. Production of ethylene oxide by direct oxidation. P. W. Sherwood. *Chim. et Industr.*, 1953, **70**, 1078–80.—Direct oxidn process for C_2H_4O, discovered in 1930, is gathering importance owing to need to save Cl. C_2H_4O production in the U.S.A. planned for 439,000 tons in 1955. Direct oxidn (200°–300° C, atm pressure, Ag cat) uses air with low (<3%) concn of C_2H_4, to avoid formation of explosive mixture. Conversion per pass is 40–45%, with overall yield up to 60%.

Elimination of excess ht due to complete oxidn of C_2H_4 is main problem. Feed must be free from C_2H_2 and contains inhibitor (dichlorethylene) which minimizes complete oxidn. If ethylene glycol is desired end-product C_2H_4O is absorbed in H_2SO_4 (1%) or oxalic acid; C_2H_4O itself can preferably be recovered by absorption in H_2O under pressure or by adsorption on activated C; latter process is complex. V. B.

1023. Ten tons pressure in polythene plant. J. D. Wright and J. H. Shipley. *Petrol. Engr*, Aug. 1953, **25** (8), C3–5.—The highest industrial pressure of 20,000 p.s.i. is used in the new polythene plant. Ethylene of high purity is prepared from raw material gas, which is dried before removing ethane to convert to ethylene. The ethylene product, after separation by fractional dist, is purified, dried, and stored under high pressure. Under the high pressure, ethylene is fed to the reactor, the product being removed as soon as it is formed to ensure a continuous process, the operation being by remote control. Polythene, after separation from unchanged ethylene, emerges in a viscous water-white form, which is chilled and chopped into pellets or " flake " for storage. G. H. G.

1024. Desulphurizing process has wide applications. C. M. Jones. *Petrol. Engr*, July 1953, **25** (7), C27–8.—Autofining, a new desulphurization process, has a daily output of 500,000 gal. Figures are given for autofining of straight run gasoline and naphtha, kerosine, gas oils, and aromatic SO_2 extracts. G. H. G.

1025. Catalyst regeneration control. K. V. Kratochvil and D. E. Berger. *Petrol. Engr*, July 1953, **25** (7), C13–15.—It is of considerable importance, both from economic and production standpoint, to maintain a dehydrogenation cat at a high degree of activity. Probably the most important factor in this respect is the cat regeneration, and it has been shown that regeneration must be consistent from cycle to cycle, and as thorough as the considerations of burn-out time and oxygen content will permit.

For correct burn-out conditions, an infra-red analyser has been used to record the CO_2 content of the effluent regeneration gas. The most significant result arising from the installation of the instrument has been the continuous and accurate record of CO_2 provided. G. H. G.

1026. Oxidizing catalyst at peak performance. E. B. Brien. *Petrol. Engr*, Aug. 1953, **25** (8), C15.—Platinum alloy cat installed to oxidize regenerator flue gases are still operating at 100% efficiency and without loss of any of their qualities after 12 months or over 8500 hr of continuous operation. In a 5% CO flow and sub-cooling of the gases, heat recovery is estimated at 25×10^6 B.T.U/hr. Cat is an alumina and platinum alloy film, 0·003 inch thick, covering 73 ceramic sticks about 5·5 ft long. Sticks are staggered in rows between 3-inch square ceramic end plates, the total area of the sticks taking up half the total cross-section of the unit. The brick (" oxycat ") permits gas to flow up and around the sticks. For every B.T.U/cu. ft. in the flow, the cat can raise the temp 55° F. The commercial uses of the cat are given. G. H. G.

1027. New " fluid coking " process boosts domestic fuel yields from residual oils. A. L. Foster. *Petrol. Engr*, Sept. 1953, **25** (10), C38.—The process is claimed to mean a reduction of crude requirements in industry by 800,000 brl p.a. 3 new units are in the planning and designing stages. In the new process a 10,000-brl charge of heavy residuum is converted into the following yields of more stable products: coker gasoline 2500 brl, gas oil 5300 brl, coke 490 tons. When the gas oil has been processed in a cat cracker, the yields are: cat cracked gasoline 2200 brl, cycle stock 450 brl, heating oil 1500 brl.

During the process, 90 tons of coke may be burned as process fuel, or natural or refinery gas burned. Coke is circulated as a heat medium in the reactor. G. H. G.

1028. Production of styrene from butadiene. V. I. Komarewsky *et al.* *Chim. et Industr.*, 1953, **70**, 1074–7.—Dimerization of butadiene to 4-vinyl-*cyclo*hexene-1 was accomplished with 47% dimer yield using 1–1 ratio of butadiene–65% phosphoric acid, at 26 atm, 235° C, 30 min. Flow diagram of lab equipment for continuous operation given. Dehydrogenation (8% Cr_2O_3 on Al_2O_3, 550° C, in presence of H_2) of dimer yields ethylbenzene (49%) + styrene (16%). V. B.

1029. Patents. U.S.P. 2,654,714 (16.11.50; 6.10.53). W. H. Kirkpatrick, assr to Visco Products Co. A process of breaking water-in-oil emulsions by treating such emulsions with an inorganic ester of an oxygen-containing inorganic acid and an aliphatic polyoxyalkylene compound having a terminal hydroxy group.

U.S.P. 2,655,442 (23.8.48; 13.10.53). B. J. Mayland, assr to Phillips Petroleum Co. Process and apparatus for the manufacture of synthesis gas.

U.S.P. 2,655,443 (2.3.48; 13.10.53). F. H. Moore, assr to Texas Co. Synthesis gas generation.

U.S.P. 2,655,466 (30.12.42; 13.10.53). E. J. Gohr, H. Z. Martin, C. E. Jahnig, and J. M. Graham, assrs to Standard Oil Development Co. Process for shutting-down cat apparatus employed for the conversion of hydrocarbons.

U.S.P. 2,655,482 (23.7.52; 13.10.53). J. B. Holtzclaw and J. D. Brooks, assrs to Standard Oil Development Co. Improved process for the production of a soln comprising sodium sulphur salts.

U.S.P. 2,655,483 (23.7.52; 13.10.53). J. B. Holtzclaw, assr to Standard Oil Development Co. Improved process for the production of a soln comprising sodium sulphur salts.

U.S.P. 2,656,254 (11.12.48; 20.10.53). G. L. Heller, assr to Columbian Carbon Co. A process for the production of furnace carbon by the decomposition of hydrocarbons.

U.S.P. 2,656,306 (25.5.51; 20.10.53). E. V. Bergstrom and E. R. Sorf, assrs to Socony-Vacuum Oil Co. Method and apparatus for conducting moving contact material hydrocarbon conversion processes.

U.S.P. 2,656,307 (15.12.49; 20.10.53). R. A. Findlay, assr to Phillips Petroleum Co. A process for converting ethane and liq high-boiling hydrocarbon, *e.g.* heavy gas oil, fuel oil, crude residuum, and mixtures thereof.

U.S.P. 2,656,309 (5.2.51; 20.10.53). W. T. Brown. A process for producing coke, which comprises mixing dry, non-coking, carbonaceous material with bituminous material composed essentially of unsaturated, polynuclear hydrocarbons having a b.p. in excess of 300° C, and heating the mixture in a horizontal, bottom-heated retort to a temp to cause polymerization of the hydrocarbons and formation of giant polymers having substantial bonding characteristics.

U.S.P. 2,656,392 (13.12.48; 20.10.53). W. A. Schulze and W. W. Crouch, assrs to Phillips Petroleum Co. A process for the manufacture of dialkyl disulphides from low mol. wt. mercaptans.

U.S.P. 2,656,395 (8.6.51; 20.10.53). R. E. Benson, assr to E. I. du Pont de Nemours and Co. The process for the preparation of a nitro-olefin which comprises reacting with nitric oxide an olefin containing more than 2 carbon atoms, the reaction being conducted in an acid medium in the absence of air at temp from 80° to 150° C and under pressure of 50–400 p.s.i.

U.S.P. 2,656,920 (30.4.53; 27.10.53). R. Kollgaard, assr to Houdry Process Corpn. Elutriator for hydrocarbon conversion systems. D. A. R.

U.S.P. 2,657,986 (15.8.46; 3.11.53). F. T. Barr and K. J. Nelson, assrs to Standard Oil Development Co. Production of water gas from fluidized low temp carbonization coke and steam.

U.S.P. 2,657,987 (12.10.46; 3.11.53). F. T. Barr, assr to Standard Oil Development Co. Production of water gas from coke produced in a fluidized carbonization zone, the carboniza-

tion products boiling above 700° F being cracked and returned to the carbonization zone.

U.S.P. 2,658,041 (11.2.49; 3.11.53). J. W. Teter and L. E. Olsen, assrs to Sinclair Refining Co. Cat for production of nitrogen-containing products by direct reaction of ammonia with olefins consists of the reduction product of mixed cobalt and magnesium oxides supported on a diatomaceous earth.

U.S.P. 2,658,075 (Germany 27.4.51; 3.11.53). W. Reppe, W. Schweckendiek, and H. Kroeper, assrs to BASF. Saturated aliphatic carboxylic acids and their anhydrides are made by heating a mono-olefin and a saturated aliphatic monocarboxylic acid to 180°–300° C in the presence of a nickel salt of the acid in complex formation with pyridine or triphenyl phosphine, while maintaining a carbon monoxide pressure of at least 100 atm.

U.S.P. 2,658,083 (26.4.51; 3.11.53). D. E. Burney and W. J. Cerveny, assrs to Standard Oil Co. Aldehydes in a reaction mixture from the OXO process applied to a *sec*–olefin–*tert*–olefin copolymer, are selectively hydrogenated by contacting the mixture with hydrogen at 150°–700° F a pressure above 500 p.s.i. and a liq space velocity between 0·1 and 5·0 vol charging stock/vol reaction zone/hr, in the presence of a cobalt cat.

U.S.P. 2,658,087 (3.6.48; 3.11.53). R. Landau and R. B. Egbert, assrs to Chempatents Inc. Gaseous mixtures containing 10·5–10 vol % olefins, inert gas and other hydrocarbons, and hydrogen are contacted with chlorine at −10°–100° C, the amount of chlorine being 0·7–0·98 mol/mol of olefin. The chlorine is introduced at spaced intervals along the reaction zone, as is cooled liq olefin dichloride which condenses the olefin dichlorides formed.

U.S.P. 2,658,088 (25.1.49; 3.11.53). R. Landau and R. B. Egbert, assrs to Chempatents Inc. Gaseous mixtures containing 0·5–5 vol % ethylene are contacted with chlorine at 15–500 p.s.i.g. and 60°–100° C, the amount of chlorine being 1·05 mol/mol of ethylene. Details of the process are otherwise as in U.S.P. 2,658,087. J. M. S.

Ger.P. 900,696, 19.11.53. Michael, Ehrmann, and Schmidt, assrs to BASF. Process for converting CO with H_2 to hydrocarbons.

Ger.P. 901,052, 19.11.53. Dorschner, assr to Metallges AG, Frankfurt. Method for obtaining a CH_4-rich gas and higher hydrocarbons, and contingently hydrocarbon compounds containing O_2.

BrennstChemie, 1953, **34** (23–24). R. T.

METERING AND CONTROL

1030. Trends in refinery instrumentation. Pts 10 and 11. Liquid level measurement and control. S. D. Ross and W. W. Drake. *Petrol. Engr*, Aug. 1953, **25** (8), C7–10; Sept. 1953, **25** (10), C17.—Various systems of liq level instrumentation fall into 4 main classes—free float devices, displacement-float mechanisms, hydrostatic pressure methods, and electrical and electronic methods. Each method is dealt with separately from viewpoint of measurement, control, installation, and maintenance.

A force balance system, using the buoyancy principle for liq level measurement is given. Where liq levels must be measured and controlled over wide ranges, free float and displacement offset mechanisms are replaced by one of the earliest devices, the simple differential manometer, *e.g.* pressure gauge, diaphragm box, and air purge methods. Other methods given are the electrode system, inductance method, use of thermocouples, ultra-sonic radio-isotopes, and the oscillator–gauge combination, coupling the modern electronic methods with the old gauge or column glass. G. H. G.

1031. Recent advances in automatic control and in remote control by electro-pneumatic mechanism. V. Broida. *Chim. anal.*, 1953, **35**, 291–302.—Review, with diagrammatic illustrations of various types (Foxboro Dynalog, Leeds and Northrup, Hartmann and Braun, Siemens, Askania), and with special reference to the Arca-Broida electro-pneumatic controller, which has no continuous air consumption. V. B.

1032. Progress Review 29. Instrumentation for process control. S. T. Lunt and A. J. Young. *J. Inst. Fuel*, Jan. 1954, **27** (156), 39.—The emphasis in this review is placed on the progress made in the theory and application of process control techniques. Aspects particularly considered are: plant analysis, matching a controller to a plant, interpretation of frequency response diagram, commercial controlling units, correcting units, valve positioners, flow measurement and control, pH measurement and control, and transmission of information. There are 25 literature refs. D. K.

1033. Batch weighing for process control. A. H. McKinney. *Mech. Engng, N.Y.*, Dec. 1953, **75** (12), 975.—Equipment for blending 5 liquids and 2 solids in any desired proportions is described and illustrated. Selector switches enable specific components to be selected from any of several tanks, and interlocks prevent certain of the materials being added unless operating conditions are correct. Considerable flexibility to choose among several different formulæ is provided. The accuracy of the system is analysed, and future improvements discussed. T. T.

1034. Flow controller. R. Müller. *Erdöl u. Kohle*, 1953, **6**, 799–800.—Examples given of application of flow controller to pneumatic level-indicating device, whereby pressure variations within the air supply are prevented from influencing rate of bubbling of air in container being tested. V. B.

1035. New process for measuring liquid flow. Liquid flow measure by areometer. A. Liebaut. *Chim. anal.*, 1953, **35**, 328–31.—Illustrated description of flow meter in which liq flow raises valve, displacement of which is converted to elec signal which can be remotely indicated. Valve can be either spring or wt loaded, operating temp can be 100° C, and accuracy is ¼% of full scale. V. B.

1036. Statistical quality control. J. F. Walter. *Petrol. Refin.*, 1954, **33** (2), 149–52.—An account of an experimental application of statistical control to the quality of the top product from a 62,000-b.d. fractionating tower. The number of samples and the number of process adjustments required were reduced, and the product variability was halved when the process was in statistical control. R. D. S.

1037. Instrumenting a chemical feed system. R. T. Sheen. *Oil Gas J.*, 15.3.54, **52** (45), 106.—A controlled-volume pump has been designed to accurately meter liq in measured volumes against a positive pressure differential between suction and discharge of pump. Pump consists of a plunger reciprocating in a properly designed displacement chamber at a speed sufficiently slow to ensure complete positive displacement of a vol of liq equiv to a cyl of plunger dia and stroke length. Diagrams and photographs show typical chemical feed system, pH control systems, and controlled-volume pump. G. A. C.

1038. Try this practical form of heat and material balance. H. Bottomley. *Petrol. Refin.*, 1954, **33** (1), 159–61.—By tabulating the heat and material content of the various streams in a process as shown here, the calculation of the balances is simplified, and the resulting table provides a useful summary of the information needed to size the vessels, pumps, and exchangers, and a ready reference of operating data for the unit. R. D. S.

1039. Patent. U.S.P. 2,257,341 (29.7.50; 27.10.53). B. L. Covert and H. E. Dahlquist, assrs to Universal Oil Products Co. An electronic liq level control apparatus. D. A. R.

PRODUCTS

CHEMISTRY AND PHYSICS

1040. Relationships between the molecular volume, refraction, and polarization of the tri-*n*-alkylmethanes. A. Audsley, F. R. Goss, and D. A. Pantony. *J. Inst. Petrol.*, 1954, **40**, 45–9.—The mol refractions of the series from 5-*n*-butylnonane to 13-*n*-dodecylpentacosane show a constant increment for each addition of $(CH_2)_3$. The exaltations for the complete series of trialkylmethanes from *iso*butane do not, however, have a constant value, but exhibit a discontinuity at 3-ethylpentane. This discontinuity is also exhibited by other physical properties, such as the density. A. R. W. B.

1041. The synthesis and properties of tertiary methanes. F. Challenger and D. A. Pantony. *J. Inst. Petrol.*, 1954, **40**, 37–44.—A series of tri-*n*-alkylmethanes from propyl- to dodecyl- has been prepared. Methods of synthesis and purification are outlined. Refractive index, density, surface tension, and dielectric constant of each hydrocarbon have been determined, and the mol. refraction, parachor, and electric polarization calculated. A. R. W. B.

1042. Alkylnaphthalenes. Pt IX. 1 : 6- and 1 : 7-Dimethylnaphthalene. R. F. Evans and J. C. Smith. *J. Inst. Petrol.*, 1953, **39**, 716–27.—These 2 dimethylnaphthalenes have been prepared by unambiguous syntheses and their infra-red and U.V. spectra recorded. Other physical properties are given. The reaction of β-*p*-toluylpropionic ester with a Grignard reagent has been investigated. A. R. W. B.

1043. Alkylnaphthalenes. Pt X. 1 : 4 Dimethylnaphthalene and some trialkylnaphthalenes. R. F. Evans, J. C. Smith, and F. B. Strauss. *J. Inst. Petrol.*, 1954, **40**, 7–13.—1 : 4-dimethylnaphthalene has been prepared and purified, and its physical constants and U.V. and infra-red spectra are recorded. From 1 : 3- and 1 : 4-dimethyl-5-keto-5 : 6 : 7 : 8-tetrahydronaphthalene the corresponding trimethyl- and dimethyl-naphthalenes have been prepared, and their spectra are recorded. A. R. W. B.

1044. Investigation of the sulphur compounds present in middle distillate SO_2-extracts. R. Emmott. *J. Inst. Petrol.*, 1953, **39**, 695–715.—A satisfactory analytical procedure has been devised from those previously recorded for identifying the types of S compounds present in middle dist. In particular, a method for the separate removal and estimation of thiophene using basic mercuric sulphate was developed. Sulphur group analyses of SO_2-extracts from Kuwait, Iraq, and Texas middle dist have been carried out. Reactive sulphides, thioethers, in each extract accounted for most of the sulphur content. Some aromatic sulphides appeared to be present, but only the Texas oil contained appreciable amounts of mercaptans, disulphides, and thiophenes. A. R. W. B.

1045. Ion exchange resins in hydrocarbons. A. Gemant. *J. Inst. Petrol.*, 1954, **40**, 50–4.—The action of synthetic ion exchange resins on organic ions in hydrocarbons, including oils using a radioactive tracer technique, has been investigated. Results obtained show that the removal of acidic or basic compounds from hydrocarbons is possible by this method. A. R. W. B.

1046. Detergency of carbon black. Pt VI. The stability and mechanism of settling of carbon black dispersions in organic liquids. F. H. Garner, C. W. Nutt, and M. F. Mohtadi. *J. Inst. Petrol.*, 1953, **39**, 677–87.—For dispersions of carbon black in organic liq and soln of detergent additives a settling theory based on hindered aggregation under Brownian motion to form a scaffolding structure gives a satisfactory interpretation of the form of settling encountered. A correlation has been found between the settling rate and the product of the density and surface tension of the dispersing liq. The viscosity of non-settling dispersions is also discussed. A. R. W. B.

1047. Composition and washing out of crude benzene from coke-oven gas. G. Wunderlich. *BrennstChemie*, 1953, **34** (23–24), 367–75.—Equilibria are calculated for the washing process for crude benzenes, and diagrams constructed for the system wash oil–crude benzene. These diagrams represent operating conditions better than the conventional diagrams for the system wash oil–pure benzene. R. T.

1048. A note on the modified Gray–King assay of oil shale. G. E. Mapstone. *J. Inst. Petrol.*, 1953, **39**, 848–50.—Quantitative data are given for the influence of cooling bath temp on the recovery of low boiling naphtha during assays on oil shales. A. R. W. B.

ANALYSIS AND TESTING

1049. Continental's tests for determination of per cent stable oil and tank vapours volume in separator oil. C. T. Ardoin and C. E. Lamb. *Petrol. Engr*, Sept. 1953, **25** (10), C34–5.—The method consists of 2 flash tests, one conducted in the field, the other in the lab. Equilibrium separator oil is metered and flashed in a 100-brl atmospheric test tank to determine the ratio of stable oil to equilibrium oil. Immediately following this flash test, a sample of the equilibrium oil is taken for lab testing.

The apparatus consists of a sample bomb, dist unit, scrubber, gas meter, Reid vapour pressure bomb, 2000-ml graduated cyl, and suitable hydrometer. Check on the % of the stable oil determined by the field flash test is obtained by dividing the vol of dist " bottoms " by the charged vol. The vol of flashed vapours divided by the vol of sample charged and expressed in brl represents the equivalent vol of stock tank vapours contained in each metered brl of separator oil. G. H. G.

1050. Experience in water estimation in coking coal. W. Klempt. *BrennstChemie*, 1953, **34** (19–20), 294–8.—The process for continuous H_2O determination is based on the change in capacity of a parallel-plate or plane-surface condenser. When one plate is earthed, the other charged with a high-frequency current, a linear field of force is produced in the dielectric, and the condenser is charged to a definite capacity which, according to equation $C = \frac{F}{4\pi \cdot d} \cdot \varepsilon$, depends on F = condenser surface, d = distance between plates, ε = dielectric const of medium introduced. Taking ε for air = 1, val for non-conductors lie between 2 and 7, for H_2O, 81. Numerous factors, cancelling or additive, affect the results. Useful and reproducible results are obtained for coals in which all factors but H_2O cont remain const over a long period. Apparatus is illustrated. R. T.

1051. Useful filtration apparatus. W. R. Battles. *Petrol. Engr*, July 1953, **25** (7), C33–4.—Special filtration apparatus needed in the course of investigating the suspended PbS content of gasoline. Apparatus designed possesses advantages of: (1) rapid set-up; (2) positive sealing without any special care; (3) larger volume capacity of funnel per area of filter paper, making filtration less tedious. Construction of apparatus and procedure is given, with uses illustrated by determination of suspended PbS content of a gasoline, and the determination of the plugging qualities of a stove oil. G. H. G.

1052. Problems in hydrocarbon extraction. D. L. Katz, R. H. Schatz, and B. Williams. *Oil Gas J.*, 2.11.53, **52** (26), 108.—This is Pt 2 of the University of Michigan paper, and deals with data on thermal properties, density, visc, and surface tension, which are required to obtain heat balances in process design. G. A. C.

1053. Synthesis of inhibitors and additives for oils. H. Mosurski. *Bull. Polish Inst. Petrol.*, 1953, **3**, 9–10, (Suppl. to *Nafta (Krakow)*, 1953, **9**).—Middle cut of gas oil fraction was

refined with 20% oleum in several batches and, after washing, chlorinated. This was treated with aq ammonia in an autoclave; cat was used. The resulting dialkylamine was treated with P_2S_5 and then purified. It forms an acidic substance whose salts (and oxy-salts) are very good inhibitors (especially Ba salt). To avoid difficulties of later incorporation the substances are reacted in oily soln. Na, Ca, Zn, Al, Cu, and Co salts have been prepared, and all show good inhibiting properties. Further research is going on into suitability of various kinds of hydrocarbons as the base for this additive. Also oxidized gatch and organic acids are being investigated. Many give additives of diverse properties. Other research covers salts of sulphonaphthenic acids from waste alkalis from acid refining of white oils. M. S.

1054. Molecular distillation apparatus with great separating power. W. G. Aldershoff, H. Booy, S. L. Langedijk, G. Th. Philippi, and H. I. Waterman. *J. Inst. Petrol.*, 1953, **39**, 688–94.—An apparatus with 9 stages of vaporization and condensation, in which the liq phase is transferred mechanically from stage to stage, is described. Results obtained indicate that the separating power is considerably better than with the known single-stage apparatus. A. R. W. B.

1055. Determination of calorific value of solid fuels using capsules. K. E. Stumpf. *BrennstChemie*, 1953, **34** (21–22), 341.—Cellulose acetobutyrate capsules are shown by experimental data—tabulated and discussed—to be superior to gelatine capsules as envelopes in cal. val. estimation of fuels. (DIN51708). The latter give erratic val for heat of combustion, presumably due to H_2O cont. R. T.

1056. Modified ASTM distillation for ten millilitre samples. J. S. Wiberley and R. K. Siegfriedt. *Petrol. Engr*, Aug. 1953, **25** (8), C12–14.—The method described is a scaled down version of ASTM D86–52, which retains all the test conditions of the standard method with the exception that a 10-ml sample is used. Results check the standard test, except that 90% points tend to be *ca* 5° high and F.B.P 10° low. It is not faster than the standard test, and is designed for cases where only small samples are available. G. H. G.

1057. Analysis by adsorption on silica gel applied to study and control of solvent refining of lubricating oils. G. Costantinides, T. Policastro, and G. Arich. *Rev. Inst. franç. Pétrole*, 1953, **8**, 447–53.—Column (diagram) 2·1 m long, 12 mm dia, thermostated at 70° C to keep wax in soln, packed with 150 g 190–200 mesh silica gel; 10-g sample in 2 vol *n*-heptane, followed by 300 ml *n*-heptane and desorbed with 200 ml 1/1 C_6H_6/EtOH; percolation rate 2 ml/minute. Yields can be plotted in various ways against n_D^{60}; results (for raffinate and extract) given for 3 Middle East furfural refined lub cuts. For plant control (check on selectivity) test on extract (4 hr), to ensure absence therein of raffinate, is sufficient. V. B.

1058. Test for presence and evaluation of product soluble rust inhibitors. P. L. De Verter. *Petrol. Engr*, Sept. 1953, **25** (10), C35.—Method involves stirring a mixture of the inhibited product and dist water at room temp with a cyl steel rod. The appearance of the rod is rated as shown in the accompanying table. G. H. G.

1059. The application of the polarograph to the paint industry. W. P. Georgans. *J. Oil Col. Chem. Ass.*, Feb. 1954, **37** (404), 84.—Literature on polarography related to the paint industry is reviewed. Brief account of the polarographic theory and the construction of a simple polarograph is included. New procedures used for polarographic estimations for some metal in driers, pigments, and maleic anhydride in phthalic anhydride are described. 42 literature refs. D. K.

1060. Apparatus for the laboratory testing of the wash and scrub resistance of water paints. D. Atherton and W. Peace. *J. Oil Col. Chem. Ass.*, Jan. 1954, **37** (403), 44.—The apparatus is described. 4 paints are tested simultaneously, and 6 tests can be made on each paint. The paint surface is rubbed with a loaded (2 kg) nylon coated head (1 inch dia) at the rate of 50 × 6 inch strokes/minute, and the paint film is kept soaked with a 2% Lissapol N soln. If paints show no failure after 1 hr they are considered excellent for wash and scrub resistance and for adhesion to the surface under test. D. K.

1061. Conversion of kinematic viscosity (centistokes) to Redwood No. 1 seconds. Anon. *J. Inst. Petrol.*, 1953, **39**, 846–7.—A table for converting centistokes to Redwood No. 1 sec based upon the new standard value for the visc of water at 20° C of 1·0038 cs is given. A. R. W. B.

1062. The Sunbury X-ray absorption method for the rapid determination of sulphur in hydrocarbons. R. W. Cranston, F. W. H. Matthews, and N. Evans. *J. Inst. Petrol.*, 1954, **40**, 55–63.—A method is presented taking approx 5 minutes for a S determination on a dist sample to an accuracy of ±0·03%. The principle and equipment required are described, and experimental results are given which show the repeatability of the method and its accuracy. A. R. W. B.

1063. Knock rating instrumentation on CFR engines. Anon. *J. Inst. Petrol.*, 1954, **40**, 36.—A note drawing attention to an impending change in knock rating instrumentation on these engines. A. R. W. B.

1064. Co-operative mass spectrometric analysis of C_1–C_4 hydrocarbon mixtures. J. Blears and J. D. Waldron. *J. Inst. Petrol.*, 1954, **40**, 1–6.—To establish the accuracy of British sector type mass spectrometers on hydrocarbon analysis 4 synthetic paraffin–olefin mixtures were analysed on each of 8 instruments. Results calculated on blended components showed only average discrepancies of 0·4 mol %. By a general method of computation slightly larger differences were obtained. A. R. W. B.

1065. Speed up natural gasoline analysis. S. T. Preston and D. E. Smith. *Petrol. Refin.*, 1954, **33** (2), 137–9.—In order to express the results of low temp analysis of natural gasoline on a mol % basis the mol. wt. or vapour equiv of the liq residue must be determined. The method of determination described here depends on the change in pressure when a measured vol of the residue is placed in an evacuated flask. Comparison with a known hydrocarbon enables the vapour equiv to be calculated. R. D. S.

1066. Asphalt analysis—7. R. N. Traxler and H. E. Schweyer. *Oil Gas J.*, 2.11.53, **52** (26), 133.—Asphalt composition is discussed. Condensed nuclei concept is refuted, oils present in paraffinic and cyclic fractions are of similar composition to those in lub oils and oily fractions in asphaltic materials considered to be polycyclic naphthenes and aromatics. G. A. C.

1067. Electrical apparatus for accelerated ageing of insulating oils. T. Rummel. *Siemens Z.*, 1953, **27**, 431–3.—Test cabinet described and illustrated. Oil is placed in discharge cell surrounded by thermostatically-regulated water-jacket. Oil is degassed under vac whilst stress (12 kV at 400 cs) is applied; current density and thermal effects of discharge are limited. Gassing tendency of oil is measured by amount of current (mA/minute) required to raise pressure from <1 to 60 mm. P.F. of oil is measured before and after. P.F.–temp curve of artificially aged (20 minute) oil compares very closely with that of same oil after 9 years service in condenser of high frequency furnace. V. B.

1068. Short cut to correlation index. K. A. Harper. *Petrol. Process.*, 1954, **9** (2), 221.—A nomograph is presented for estimating the correlation index from a knowledge of the average b.p. in ° F, and visc in ° API. J. W. H.

1069. Operating behaviour and bench testing of motor oils. V. Worbs. *Erdöl u. Kohle*, 1953, **6**, 828–30.—Limitations of both laboratory and road tests discussed, and factors of oil ageing leading to engine deterioration considered. Test-bench procedure briefly explained, with indication of point rating for engine parts used in German laboratories, and similar to U.S.A. procedure. V. B.

1070. Patent. Ger.P. 900,620, 12.11.53. Krutzsch, Munchen-Solln. Process for measuring liq-density (Addn. to Pat. 829,229).

BrennstChemie, 1953, **34** (23–24). R. T.

CRUDE OIL

1071. Prospects of Eastern Hemisphere crudes. E. C. Campioni. *Petrol. Engr*, Aug. 1953, **25** (8), C18.—Compositions, dist, and other characteristics of crudes from Borneo, Sumatra, etc., are given, with the general qualities for the derivation of gas oils, kerosines, lub oils, and asphalts. G. H. G.

GAS

1072. Twenty years of growth in the natural gas industry. J. M. Hanley. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 71–4.—In 20 years annual sales of natural gas in the U.S.A. have risen from $1{\cdot}6 \times 10^{12}$ to $8{\cdot}6 \times 10^{12}$ cu. ft.; available reserves have risen from 50×10^{12} to 200×10^{12} cu. ft. Gas wastage has been greatly reduced. Metering has been improved. Insulated coupling with wells reduces galvanic casing corrosion. Advances have been made in gas processing for recovering liquefiable hydrocarbons. Elemental sulphur is now recovered in gas treatment, and solid desiccants are now used more widely in gas dehydration.

Gas turbine-driven centrifugal compressors are beginning to be used in large volume low-compression ratio installations. Semi-automatic field gathering compressor stations have been constructed. There has been great progress in pipeline construction. Protective coatings are now standard practice, with other devices to minimize corrosion. There are improved flow formulæ and cleaning methods.

Underground storage has been developed to smooth loads, and about 150 fields capable of storing 1×10^{12} cu. ft. can give 4×10^{9} cu. ft/day. One such reservoir, which appears to be a success, is a water-bearing structure, and not a depleted field. There is a decline in the processing of a gas for carbon black, but an increase for petrochemicals. G. D. H.

1073. Gas technology—its growth and development. R. E. Davis. *J. Petrol. Tech.*, Sept. 1953, **5** (9), 67–9.—Before *ca* 1925 natural gas was marketed mainly near the producing regions; consumption was below 1×10^{12} cu. ft/year. At that time reserve estimates were based on imperfect data, many factors being ignored or unknown. Now more certain estimates are needed in planning projects. Before 1925 bankers and insurance companies considered the natural gas industry too risky for the investment of their funds. Prior to that time gas lines were built on the judgment of practical gas men, financed to some extent by wealthy individuals, and also by oil companies wishing to market their gas. From 1925 to 1930 lines were coupled, lap welded, and designed for pressures up to *ca* 500 p.s.i.; dia ranged 14–24 inches. The depression brought natural gas pipeline expansion substantially to a halt in the 1930–40 period, and little attempt was made to conserve gas produced with oil. Technical developments in pipeline construction and operation made it economically practicable to transport gas even for distances exceeding 1000 miles by *ca* 1941, and various lines were built or expanded under the impetus of war needs. This process continues, and there are now over 18,000,000 consumers of natural gas, and the service is available to *ca* 50% of the U.S. population, compared with 12% in 1925.

Levelling off of enlargement processes in the pipeline industry is or should be near at hand. G. D. H.

1074. Reflections on natural gas and its economics in U.S.A. M. J. Echard. *Bull. Ass. franç. Tech. Pétrole*, March 1953, **31**, 21–37.—In 1950 petroleum and natural gas provided more than half the primary energy used in the U.S.A., and this proportion was greater than a few years ago. Gas gave over 20% of the total energy. The gas reserves were 465×10^{10} cu. m., and nearly 60% of this was in Texas. The price per therm has fallen from 1c in 1922 to 0·45 c in 1945. This was much below the figure for solid fuels or fuel oil at the source.

A map shows the main U.S. gas pipelines, and transmission costs are discussed. The utilization of the gas is briefly described, and amounts used in various ways are indicated for a number of years. In 1945 the price for domestic use was 7·53c/therm, for industrial use 1·55c/therm, and for commercial use 4·2c/therm. The mean figure was 3·4c/therm, and of this the production cost was 0·5c, transport 1c, distribution 1·15, and taxes 0·4c/therm.

Most of the large gas lines run from south to north, and are over 1000 miles long. To maintain a fairly uniform load factor throughout the year local storage is required near the distributing point, and the possibility of using underground storage is being considered. G. D. H.

1075. Liquid fractions by refrigeration. D. E. McFaddin. *Petrol. Refin.*, 1954, **33** (1), 162–4.—Facts and figures presented here indicate that refrigeration processes are worthy of consideration as a means of recovering natural gasoline fractions from natural gas where capital expenditure must be kept to a minimum and where the life of the project may be short. Simple refrigeration will recover most of the pentanes and heavier fractions, while refrigeration combined with absorption, using vacuum-stripped gasoline ends as absorbent, may be advantageous where the recovery of butanes and lighter is required. R. D. S.

ENGINE FUELS

1076. Trend to high octane is sound. E. V. Murphree, J. P. Haworth, A. F. Kaulakis, and A. R. Cunningham. *Petrol. Refin.*, 1954, **33** (1), 229–32.—Analysis of figures for the last 20 years shows that as engine C.R. has increased so has the O.N. of the gasoline available. This higher quality gasoline has been produced from less crude because of the improvement in refinery processes. The small increase in energy required to produce this gasoline has been more than offset by the increase in efficiency of the higher C.R. engines using it, resulting in a net increase in conservation of raw materials. R. D. S.

1077. Tricresyl phosphate in motor fuels. G. Schönwälder. *Erdöl u. Kohle*, 1954, **7**, 78–81.—Pre-ignition and spark plug fouling originally mainly of importance in aero-engines; one large engine can have Pb intake of 1 ton/1000 hr. Causes of deposit formation and mechanism of pre-ignition and spark plug fouling discussed; analyses and m.p. given of engine deposits when operating on leaded fuels and on such +TCP. Elec resistance of deposits incorporating P increases; such deposits are also less fusible, smaller, and less adherent. Additive also decreases free C formation, with consequent less reduction of Pb compounds to Pb. V. B.

1078. Gasoline additives. C. O. Tongberg, N. V. Hakala, L. E. Moody, and J. B. Patberg. *Petrol. Times*, 19.3.54, **58** (1477), 287.—In this review of the use of additives in gasoline to reduce or eliminate the harmful effects of combustion chamber deposits, the extent of the problem is outlined, and occurrence of pre-ignition and spark plug fouling discussed. Combustion cat, metallic additives, deposit modifiers, effect of tri-cresyl phosphate in " dirty " engines, use of boron and silicon compounds, and solvation agents are dealt with, and an appendix gives controlled field test technique and laboratory engine test conditions.

Among the conclusions given in the article is that none of the additives evaluated appears to provide a sufficiently attractive advantage in minimizing the problems concerned with combustion chamber deposit formation; and that pre-ignition and spark plug fouling do not appear to be serious problems in current engines. G. A. C.

1079. A discussion on the paper " Gasoline Additives." R. J. Greenshields. *Petrol. Times*, 2.4.54, **58** (1478), 342.—This is a reply to the above paper published in *Petrol. Times*, 19.3.54,

p. 287; the author of the reply concludes that there is currently a definite spark plug fouling problem, that pre-ignition is a problem in engines of recent design, that additives can control plug fouling and pre-ignition, and that TCP is effective in eliminating or minimizing these phenomena. G. A. C.

1080. New British installations for the making of tetraethyl lead. Anon. *Petrol. Times*, 5.3.54, **58** (1476), 217.—A review is given of the development of anti-knock agents, and their history in the U.S.A. and Great Britain. The TEL plant at Ellesmere Port and the bromine plant at Amlwch is described. G. A. C.

1081. Fuel additions to C.I. engine intake air. Anon. *Engineer, Lond.*, 1954, **197**, 94–6, 115–16.—Summaries, conclusions, and discussions on 2 papers read before Inst. Mech. Engrs. By spraying part of fuel into air intake of C.I. engines, combustion noise and engine roughness is reduced. Under these conditions overall thermal efficiency is impaired at light load but improved at high load; also, using intake spray, C.I. engines can run on any fuel irrespective of its cetane no., with only small differences in thermal efficiency. By aspirating a volatile fuel (gasoline) into air intake, power outputs of 20% or more above max rated load can be obtained without producing more smoke than at normal full load conditions. This compensates for higher cost of gasoline, latter being burnt at C.I. engine C.R. of 16 : 1. Discussion centred mainly around certain difficulties in making practical application of author's findings. A. C.

1082. Combustion chamber deposits and their effects on engine fuel requirements. J. J. Mikita and W. E. Bettoney. *Petrol. Engr*, Aug. 1953, **25** (8), C24.—Elimination or reduction of combustion chamber deposits offers one means of saving octane numbers. Presence of carbonaceous material appears to be the largest single factor accounting for deposit accumulation. These deposits increase octane requirements by increasing the temp of the last portion of the charge to burn, and also by causing ignition of the charge by hot surfaces. Results of lab and road tests demonstrate that large reduction in deposit knocking harm can be effected by the use of fuel and lubricant combinations which leave only small amounts of organic residues in the combustion chamber. From recent road tests, the problem remains of preventing surface ignition as well as knock. G. H. G.

1083. B. of M. survey of aviation gasoline and jet fuels, 1953. O. C. Blade. *Oil Gas J.*, 15.3.54, **52** (45), 60.—Tables show comparison of some average data for commercial aviation gasoline and summarized data on aviation jet fuels. Data include O.N., performance no., dist figures, Reid vapour pressure, sulphur aromatic content, and hydrogen–carbon ratio. G. A. C.

1084. The influence of modern refinery technique on marine fuel oil quality. C. W. G. Martin. *Trans. Inst. Mar. Engrs*, Feb. 1954, **66** (2), 25.—The paper examines the suggestion that marine fuel oils may have altered in quality due to changes in refinery processes, and concludes that modern manufacturing methods favour the production of high quality fuel oils. The consumer simultaneously benefits from superior product control technique. Consideration is given to the value of the specification tests by which fuel oil quality is frequently assessed, and an account is given of experiments conducted to verify the utility of certain of these tests. A practical study of a fuel oil additive is also described. 15 refs. Discussion. T. T.

1085. Patents. U.S.P. 2,654,697 (31.10.50; 6.10.53). H. J. Andress and F. L. Nelson, assrs to Socony-Vacuum Oil Co. A motor fuel which comprises a gasoline, normally tending to form hard, gummy deposits and to cause valve sticking when used in an I.C. engine, containing between *ca* 0·05 and *ca* 0·30% by vol, of a petrolatum stock having a Saybolt Universal visc at 210° F, of between *ca* 95 and *ca* 125 sec, a m.p. of between *ca* 115° and *ca* 135° F, an ASTM penetration at 77° F of between *ca* 60 and *ca* 110, and which has no Kauri–butanol number.

U.S.P. 2,655,440 (24.5.49; 13.10.53). M. R. Barusch and R. Y. Mixer, assrs to California Research Corpn. A compounded fuel comprising at least 10% of a diesel fuel oil, at least 10% by wt of normally liq oil-sol blending agents having mol. wt. below *ca* 700 and having a specified formula.

U.S.P. 2,656,380 (29.11.49; 20.10.53). C. R. Turner, assr to California Research Corpn. A process of producing diesel fuel oils and soaps of naphthenic acids from the naphthenic acid containing petroleum hydrocarbon fractions boiling within the range of *ca* 325° to *ca* 725° F. D. A. R.

Ger.P. 899,649, 5.11.53. Peters and von Füner, assrs to BASF. Method for producing knockproof motor fuels from liq hydrocarbons.

Ger.P. 900,758, 19.11.53. Pier and Donath, assrs to BASF. Motor fuel.

Ger.P. 900,759, 19.11.53. Schultes, assr to Deutsche Gold- und Silber-Scheideanstalt, formerly Roessler, Frankfurt (M.). Medium for preventing resin formation in motor fuels and other materials tending to resinify.

BrennstChemie, 1953, **34** (23–24). R. T.

GAS OIL AND FUEL OIL

1086. Fuel ash slagging in gas turbine plants and the concomitant corrosion of constructional materials. J. Biert and R. Scheidegger. *Schweiz. Arch. angew. Wiss.*, 1953, **19**, 359–66.—Types of fuel oil deposit considered, with special reference to H_2O solubility, in view of use of water wash methods for cleansing affected turbine parts. Corrosion mechanisms are discussed, as exemplified by systems H_2SO_4–SO_3 and H_2SO_3–SO_2, conditions in each case being considered above and below respective dew points. Results shown of tests at 900° C of corrosion of steel by V_2O_5; Cr steel is much more resistant than Cr–Ni steel. Thermo-balance described, applicable for continuous indication of wt changes in samples under test (up to 1100° C); Na_2SO_4 alone (in absence of $NaVO_3$) has no corrosive effect at 750° C. V. B.

1087. Additives in residual fuels reduce ash deposits on steam-boiler parts. O. F. Campbell. *Oil Gas J.*, 22.3.54, **52** (46), 171.—The use of dolomitic lime as an additive resulted in a powdery ash, easily removed by hand lancing with air or steam, or with retractable soot blowers. Corrosion of air heaters and ducts was also materially reduced.

A mixture of 98% MgO and 2% copper chloride was found to be equally effective. G. A. C.

1088. Bellevue experimental heating plant. G. Monnot. *Rev. Inst. franç. Pétrole*, 1954, **9**, 31–4.—Diagram and description of test installation for heating systems; 5 boilers (30,000–450,000 k.cal/hr). First tests were on use of cat cracked fuel, using 4 burners consuming 3–25 kg/hr (2 air atomized, 2 mechanical). Preliminary indications are that domestic cat cracked fuel can be used with some burners, but that adjustment can be delicate; filter-clogging on use of cracked fuel and interchange with S.R. does not appear to be a problem. V. B.

LUBRICANTS

1089. Progress in the art and science of lubrication. E. V. Paterson. *Petrol. Times*, 2.4.54, **58** (1478), 326.—This is a review of several papers dealing with use of low visc oils with lower octane fuels to reduce pre-ignition, effect of additives on combustion chamber deposits, fuel consumption and oil visc, cutting oils, bearing design, and use of aluminium for air-cooled cyl. G. A. C.

1090. Thixotropy in greases. Anon. *Petrol. Engr*, Sept. 1953, **25** (10), C42.—Thixotropy in lub greases is of considerable practical importance. Hydrated calcium soap greases have the lowest shear-softening rates, and lithium and sodium

soap greases the highest. Utilization of the property of thixotropy in the manufacture of greases and other lubricants is considered. G. H. G.

1091. Silicones in lubricants. G. Fisher. *Petrol. Engr*, July 1953, **25** (7), C17.—Purposes for which silicones are employed in solid, semi-solid, and liq lubricants are given, together with the application of silicone oils and greases in the field of lubrication. G. H. G.

1092. Application of lubricating oil additives. W. D. Thomas. *Petrol. Engr Ref. Annual*, 1953, **25** (9), C21.—During the early nineteen thirties, additives were first used on a commercial basis. Pour-point depressants may be considered as the first commercial lub oil additives, in their application in winter grade motor oils. V.I. improvers were developed to improve the visc–temp relation of oils above that obtained by refining methods.

Control of chemical properties of the oil started with the use of anti-oxidants, namely sulphur-phosphorus inhibitors, and detergent additives were developed to overcome the serious lubrication problem encountered in developing the high output diesel engines. The need for an additive to keep insoluble products dispersed in the oil led to the use of aluminium naphthenate. Although maintaining engine cleanliness by virtue of their dispersing action, these additives had a pro-oxidant effect on the oil, tending to cause burning corrosion. Sulphonates and phenates are now widely used in this capacity, together with small quantities of silicone oils to eliminate foaming.

The rapid growth of additive application is traced from 1945. Of the present day problems, cold weather sludge arising from start and stop operation is foremost. G. H. G.

1093. The lubrication of ball and roller bearings at high speed. A. Fogg and J. S. Webber. *J. Inst. Petrol.*, 1953, **39**, 743–64.—The lubrication of roller bearings operating in the speed range 6000–30,000 r.p.m. under radial thrust and combined loading has been studied on 3 test machines which are described. It is concluded that the rate of oil supply and the method, either by mist, bath, or jet lubrication, are not critical, provided the bearing housings are adequately drained. The visc of the lubricant has little direct effect on performance, but good boundary lubricating properties are usually necessary. A. R. W. B.

1094. Petroleum inventiveness—lubrication of bearings in motion. H. Weron. *Nafta (Krakow)*, 1953, **9**, 234–5.—Oil can be forced into transmission bearings by air pressure which will lift it from a reservoir through tubing. An overflow must be provided. This method allows continuous running. One diagram in text. M. S.

1095. Azelaic acid derivatives in the field of lubrication. R. W. Moncrieff. *Industr. Chem. Mfr*, 1954, **30**, 51–6.—Azelaic acid, $COOH(CH_2)_7COOH$, produced commercially by oxidn of oleic acid derived from tallow. Esters of azelaic acid with short branched-chain alcohols show good lubricating properties at very low temp (−40° to −80° F), and in conjunction with lithium stearate make satisfactory low temp greases (−60° to −90° F). One ester had a V.I. of 140, pour point −80° F, fl. pt. 490° F. Uses: lubrication of aircraft precision instruments and motors, control bearings, gunsights. Azelates soluble in petroleum, facilitating cleaning. A. C.

1096. Automobile transmission and chassis lubrication. Gear oils and greases. F. Fahlbusch. *Erdöl u. Kohle*, 1954, **7**, 45–8.—Typical car transmission, etc., is diagrammatically sectioned and its lub requirements explained. Gear oils are mainly 16°–20° E/50° C (SAE 90) with lesser requirement for 20°–40° E/50° C (SAE 140), + E.P. additives, which for hypoid gears should yield 4-ball tester value (1 inch) of 500–800 kg, although agreement with bench tests is poor. Fluid couplings require oil of 1·7°–2° E/50° C of high V.I., whilst automatic transmission fluids are 4° E/50° C, V.I. 150+, pour −40° C, + additives, especially anti-foam. Main types of chassis lubricators and lubricants described. Typical chassis lubrication diagram, with required frequency of attention, given. V. B.

1097. Foam formation and destruction in lubricating oils. K. Hoffmann. *Erdöl u. Kohle*, 1953, **6**, 791–3.—Wartime German research. Good foam suppression is given by finely-divided oil-insoluble additives (*e.g.* Na oleyl sulphate), which are introduced (0·10% on oil) in oil-sol volatile solvent. 50-hr engine tests gave favourable results; additive decreases ring sticking. Further tests are planned to investigate, *inter alia*, additive compatibility. V. B.

1098. How to predict viscosity indexes. G. W. Wharton. *Oil Gas J.*, 15.3.54, **52** (45), 135.—The accurate prediction of V.I. and visc for systems containing 2 or more V.I. improvers can be achieved from prepared blending charts.

Separate nomographs must be constructed for each pair of additives employed; they are applicable for all base oils of whatever crude oil source. G. A. C.

1099. Oxidized petroleum wax forms superior grease base. J. C. Kirk and E. W. Nelson. *Oil Gas J.*, 11.1.54, **52** (37), 97.—A process is described whereby paraffin wax is oxidized with zinc stearate and colloidal manganese dioxide cat to form a saponifiable base. Oxidn is by continuous air introduction into stirred reactor at 275° F, for a period of about 4½ hr. Addition of normal fats and fatty acids prior to final preparation affords best greases, particularly in sodium and lithium range. G. A. C.

1100. Patents. U.S.P. 2,654,696 (2.6.50; 6.10.53). W. N. La Porte, assr to Sun Oil Co. Process for improving the colour of dist lub oil without substantial hydrogenation of unsaturated hydrocarbons in the oil.

U.S.P. 2,654,708 (7.8.51; 6.10.53). E. Mitchell, assr to Gulf Research and Development Co. A lub composition comprising a major amount of a hydrocarbon lub oil, and a minor amount, sufficient to confer improved detergent properties on the composition of a polyvalent metal salt of a monoamide of a dicarboxylic acid.

U.S.P. 2,654,709 (7.6.51; 6.10.53). E. Mitchell and W. B. Morse, assrs to Gulf Research and Development Co. A lub composition comprising a major amount of hydrocarbon lub oil, and a minor amount, sufficient to impart rust-inhibiting properties to the composition, of a polyvalent metal salt of the condensation product of (1) an alkanethiol having 1–17 carbon atoms in the alkyl group, and (2) a monoamide of a dicarboxylic acid.

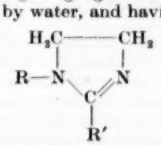
U.S.P. 2,654,710 (22.6.51; 6.10.53). B. W. Hotten, assr to California Research Corp. A grease composition comprising a major proportion of a polysiloxane base oil and a complex basic aluminium soap in an amount sufficient to thicken the polysiloxane base oil to the consistency of a grease, the complex basic aluminium soap having at least 2 unlike organo-anions.

U.S.P. 2,654,711 (15.7.49; 6.10.53). A. D. Kirshenbaum and H. W. Rudel, assrs to Standard Oil Development Co. A mineral lub oil composition containing 0·05–50% by wt of a product obtained by simultaneously reacting one mol proportion of a monocyclic terpene with *ca* 1·5 to *ca* 2 atomic proportions of sulphur and with *ca* 0·01 to *ca* 0·25 mol proportions of a sulphide of phosphorus at a temp of 120°–200° C.

U.S.P. 2,654,712 (12.9.49; 6.10.53). E. B. Cyphers and A. E. Michaels, assrs to Standard Oil Development Co. A lub oil composition comprising *ca* 88–99·99% by wt of a mineral base oil, 0·01–5·0% of the reaction product of a monocyclic terpene $C_{10}H_{16}$ treated first with 25–54% of its wt of sulphur at 220°–400° F for a period of time sufficient to substantially complete its sulphurization and treated thereafter with 0·02–10% based on the wt of the sulphurized terpene, of a phosphorus sulphide at 170°–350° F for a period of 1–20 hr, and 0–10% of an extreme pressure additive, which is a chlorinated and sulphurized and phosphorized long chain

hydrocarbon, a sulphurized and phosphorized fatty oil, or a sulphurized and phosphorized aliphatic ester.

U.S.P. 2,655,476 (26.10.51; 13.10.53). E. C. Hughes, and E. C. Milberger, assrs to Standard Oil Co. A water-resistant thickened lubricant of good temp susceptibility properties consisting essentially of a mineral lub oil of lub visc as the major component, an inorganic water-sensitive gelling agent imparting a grease-like consistency to the oil upon addition thereto as a minor component, and an oil-soluble, water-insoluble, surface-active polyamino imidazoline, being in an amount less than the gelling agent and imparting stability against deterioration by water, and having the formula:



where R is a radical containing an amino group and R′ is an alkyl, alkylene, hydroxyalkyl, or hydroxyalkylene group.

U.S.P. 2,655,477 (27.12.40; 13.10.53). J. D. Bartleson and M. H. Campbell, assrs to Standard Oil Co. Mineral lub oil containing an anti-corrosive agent and an anti-oxidant detergent agent.

U.S.P. 2,655,478 (25.6.49; 13.10.53). A. J. Deutser and F. T. Crookshank, assrs to Texas Co. An emulsifiable lubricant which is essentially non-corrosive to steel in the presence of water, comprising as the major constituent a sulphurized mineral lub oil containing loosely combined active sulphur, an alkali metal soap emulsifier, and *ca* 0·1–2·0% by wt based on the lubricant of an aliphatic C_1 to C_3 alkylene polyamine having from 3 to 20 carbon atoms in the mol effective to inhibit the lubricant against steel corrosion in the presence of water.

U.S.P. 2,656,315 (27.2.52; 20.10.53). G. W. Eckert, assr to Texas Co. A lub grease comprising an oleaginous liq as the predominating constituent, and *ca* 5–45% by wt based on the wt of the grease of a precipitated hydrated calcium silicate having a particle size of not more than 100 mμ in dia.

U.S.P. 2,656,316 (17.7.50; 20.10.53). L. L. Neff, assr to Union Oil Co of California. Lub oils containing metal salts of a condensation product of a substituted phenol and a vinyl compound.

U.S.P. 2,657,180 (9.1.50; 27.10.53). I. W. Sproule and J. S. Gray, assrs to Standard Oil Development Co. A lub grease comprising lub oil thickened with a soda soap of a mixture of commercial fats and substantially saturated fatty acids and characterized by a smooth structure and short fibre imparted thereto by cooling with mechanical working to a temp not greater than 130° F and by introducing extraneous glycerin during such cooling and working sufficient in amount to make the total glycerin content equal to *ca* 0·8 to *ca* 1·5 times that of the fats and the corresponding triglycerides of the fatty acids. D. A. R.

Ger.P. 900,090, 12.11.53. Christmann, assr to BASF. Process for obtaining lub oils.

Ger.P. 901,830, 26.11.53. Clar and Geiser, assrs to Ruhrchemie AG. Process for increasing ageing stability of synthetic lub oils.

BrennstChemie, 1953, **34** (23–24). R. T.

BITUMEN, ASPHALT, AND TAR

1101. Determination of bitumens by luminescence. J. J. Glogoczowski. *Bull. Polish Inst. Petrol.*, 1953, **3**, 9 (Suppl. to *Nafta (Krakow)*, 1953, **9**).—Since presence of bitumens in rock (cores) causes luminescence they can be roughly estimated by using U.V. light. This and further methods are used by (Polish) Geoanalytical Establishment. By moistening the surface of the core with $CHCl_3$ it is possible to determine if the luminescence is caused by bitumen or inorganic substances. Later a sample of the core is ground and a drop of chloroform placed on it. Now the U.V. lamp enables this sample to be compared with others of the same rock containing known quantities of bitumen, *i.e.* 0·01, 0·05, 0·2, and 1% w/w. Alternative method uses 5 g of sample 25 ml $CHCl_3$ for cold extraction for 48 hr, and similarly compares it with known sample. Lower limit of sensitivity is 0·001% w/w of bitumen in rock.

1102. Roughening of smooth stone paving with bitumen emulsions. W. Bierhalter. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (12), 342–6.—Smooth paving is roughened by filling the joints with suitable material, chips or coarse sand and bitumen emulsion, and rolling lightly. Chip size varies with joint size. Various modifications of the procedure using stable or unstable emulsions and aftertreatments of the surfaces produced are described. R. T.

1103. Silicones as antifoams and adhesion improvers in processing bitumen and similar materials. H. Schmidt. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (12), 337–9.—Methyl-silicone oils 1 p.p.m., (1 g/ton), are effective antifoams for mineral oils and bituminous materials. They are added to bitumens before melting, or to existing foam without affecting the material adversely, *e.g.* in steeping roofing paper and as adhesives in binders. The oils, non-volatile, remain effective at 200° C. Preparation of org Si compounds, results of tests with them, and theory of their action are discussed. In binders chlorosilanes are supposed to evolve HCl, and stone pretreatment is troublesome. R. T.

1104. New procedure for sealing waste-water pipes perfectly. H. Kölzow. *Bitumen, Teere, Asphalte, Peche*, 1953, **4** (12), 347–9.—The sealing band described and illustrated is composed of bitumen, rubber, a plasticizer, and asbestos. It is applied cold as a band to all types of concrete joints. The plastic prevents perishing. Long service is guaranteed. R. T.

1105. Cold flow of pipe coating bitumens. C. E. Lee. *Pipe Line News*, Jan. 1953, **25** (1), 64–8.—A discussion of the factors affecting the durability of pipe coatings and methods of evaluating the flow properties of coating bitumens. S. R. H.

1106. Patent. U.S.P. 2,657,092 (28.9.50; 27.10.53). P. E. Jones. Apparatus for spraying hot liq such as asphaltic emulsions on roadway surfaces. D. A. R.

SPECIAL HYDROCARBON PRODUCTS

1107. Ageing tests compare transformer oil performance. L. B. Schofield and F. T. Carver. *Elect. World, N.Y.*, 30.11.53, 81–3.—Both laboratory (based on ASTM D 943–47T) and service ageing (10-kVA transformer, 2170–120/240 V, top oil temp 95° C, loose cover, 16-hr cooling period each week) indicate that control oil (new oil + 0·3% di-*tert*-butyl-*p*-cresol) gives better life than re-refined oil, even when latter is treated to high interfacial tension (46 dynes/cm) and contains 0·6% inhibitor. Laboratory life test was 150 hr for control oil, best re-refined oil was 89 hr. Service ageing test (one year) gave 0·71 acidity and 0·03% sludge on control (normal tolerance before replacement is 0·6 and 0·015%), best re-refined was 0·94 and 0·08%. Oil re-refined to 30 dynes/cm and with 0·3% inhibitor has performance approx equal to that of new non-inhibited oil. V. B.

1108. Examination of new and used transformer and switch oils. G. Jelier. *Electrotechniek*, 1953, **31**, 466–73.—Dutch specification for transformer oil requires d_{20} 0·92 max, visc 20° C 61 cs max, −5° C 380 cs max, −30° C 3800 cs max, dielectric strength 125 kV/cm minimum, acidity 0·05 max, tar value (70 hr, 120° C, O_2) 0·10% max, with usual purity and other clauses. Significance of these requirements is discussed. Detailed maintenance schedule for oils is given, drying is recommended when the dielectric strength falls below 80 kV/cm, and replacement if the acidity exceeds 1. V. B.

1109. Influence of oil properties on transformer insulation characteristics. V. N. Zvezdkin and R. G. Nadel'son. *Elektr. Stantsii*, 1953, **3**, 45–7.—Tests on power transformers whose insulating characteristics had deteriorated showed this, in many cases, to be due to fall in dielectric properties of oil. New transformer oil has average values (50° C) of tan δ $\geq 0{\cdot}001$ and spec. res. $\leq 10^{14}$ ohm cm. Oils from unsatisfactory transformers had figures as poor as $0{\cdot}13$ and $4{\cdot}5 \times 10^{11}$, although dielectric strength and acidity were within spec limits. Importance of elec as well as physical–chem tests on transformer oil is emphasized. V. B.

1110. Petroleum waxes. S. T. Minchin. *Inst. Petrol. Rev.*, 1953, **7** (82), 32–8.—Petroleum waxes are complex mixtures of paraffin hydrocarbons which are solid at ambient temp. They differ from waxes of vegetable or animal sources in that the latter contain combined oxygen. The quantity of wax varies with different crude oils, from less than 1% to greater than 16%. Petroleum waxes may be divided into 2 groups—paraffin waxes recovered from dist fractions, and microcrystalline waxes recovered from residues. Paraffin waxes are separated either by sweating and pressing or by solvent dewaxing. Details of these 2 processes are given. Paraffin waxes in turn may be subdivided into refined paraffin waxes and white scales, the latter being in effect a less refined paraffin wax. Refined paraffin wax is marketed in grades determined by m.p. ranges of up to 5° F. Microcrystalline waxes vary in colour from white to almost black, and may contain a considerable quantity of oil. The properties of the different kinds of wax are described. It is the physical and mechanical properties in the solid state which render them so useful. About two-thirds of the petroleum wax used in the world today goes into the packaging and candle-making industries. The particular qualities desirable for these 2 uses are enumerated and the processes described. Other uses include those of polish manufacture, insulation in the electrical industry, rubber softeners, preservation of leather, and as a constituent of pharmaceuticals and cosmetics. Notes are included on trends in manufacture, testing procedures, and transport precautions. R. H.

1111. Contemporary wax-science. L. Ivanovszky. *Erdöl u. Kohle*, 1953, **6**, 787–91.—Discussion, based on the relevant chapter in Zerbe's recent book (*cf. J. Inst. Petrol.*, 1953, 64A) of the problem of wax terminology. Chem definition is unrealistic, whilst one based on purely physical characteristics produces many borderline anomalous cases. Term "wax" is best considered as referring to a group of materials complying with certain requirements as to nature (*e.g.* feel, tenacity, appearance, fusibility) and application properties (*e.g.* lustre, miscibility, solubility, plasticity). V. B.

1112. Maintenance and operation of continuous wax moulders. R. Shannon. *Petrol. Refin.*, 1954, **33** (1), 147–50.—A discussion of the operation and maintenance of the Magnolia Petroleum Co's continuous wax moulding machine, which has been in use for *ca* 3 years. A 3-fold production increase is claimed over the traditional batch process with decreased cost and improved appearance and cleanliness of the wax cakes. R. D. S.

1113. Manufacture of paraffin waxes and white petroleum jellies. M. Bidault. *Parfum. mod.*, 1953, **45** (34), 44–50.—Brief description, with outline flow sheets, of wax manufacture by 2-stage filtration (+4, −15° C), sweating and re-sweating, followed by hot acid–earth treatment. Petrolatum is obtained by propane dewaxing and subsequent adsorbent treatment. V. B.

1114. White and medicinal oils. M. Potier. *Parfum. mod.*, 1953, **45** (34), 34–43.—Brief description of white oil manufacture. Phenol raffinates are prepared at Port Jerome refinery; oleum treatment is given at another installation. Low temp filtration of refined oil removes traces of wax and final clarification is by hot vac centrifuging. Specifications for 5 white oils and 2 medicinal grades given. V. B.

1115. Progress Review No. 30 : The extraction and utilization of firedamp. L. T. Minchin. *J. Inst. Fuel*, March 1954, **27** (158), 148.—Aspects considered are: methane in coals; methods of extraction; use of methane for steam raising, firing coke ovens, direct use, adding to town gas, motive power; methods of converting firedamp; methane as a chemical, and organization and distribution. There are 29 literature refs. D. K.

DERIVED CHEMICAL PRODUCTS

1116. Petroleum and natural gas as source of petrochemicals W. Kisielow. *Nafta (Krakow)*, 1953, **9**, 124–9, 150–3.—D. I. Mendeleev considered combustion of petroleum a waste, and today petrochemicals are coming into their own, since their value is 8–10 times higher than the parent raw material. For economical reasons and facility refiners are the best manufacturers of petrochemicals. An historical review of this new industry is given as well as methods of separation of pure hydrocarbons. Petrochemical processes are briefly described. This is followed by list of products according to their nature: (1) aliphatic solvents and intermediates; (2) detergents; (3) resins, fibres, and plastics; (4) aromatics; (5) inorganic products. In the article are included 2 tables of composition of crudes (U.S.A. and U.S.S.R.), a table of reactions, 2 tables of products, and 2 flow diagrams. Soviet, German, British, and U.S. books are quoted in bibliography. M. S.

1117. Synthesis of petrochemicals—1. Ethylene production methods. A. L. Foster. *Petrol. Engr*, Aug. 1953, **25** (8), C35–6.—Ethylene is the most important of all organic intermediates made directly from petroleum and natural gas hydrocarbons. Most of the methods for ethylene manufacture are based on pyrolytic operations. Cat dehydrogenation is practicable, but not as economic as thermal methods. Recent process is thermofor pyrolytic cracking, introduced for the production of various olefins, including ethylene. G. H. G.

1118. Petrochemicals—for clothing or fertilizer. A. L. Foster. *Petrol. Engr*, July 1953, **25** (7), C3–6.—A table, giving data on several petrochemical plants in various stages of operation, construction, or planning design, indicates that the outputs of ethylene, propylene, and aromatics head the list. Interesting development is the production of paraxylene. A method is needed for the production of acetylene economically, from petroleum–natural gas hydrocarbons. Synthesis of acrylonitrile is one of the larger developments requiring quantities of acetylene. G. H. G.

1119. Synthesis of petrochemicals—2. Ammonia from natural or refinery gases and air. A. L. Foster. *Petrol. Engr*, Sept. 1953, **25** (10), C3–5.—The large quantities of cheap hydrogen required in the synthesis of ammonia are obtained directly from natural or refining gases via a cat process. Chemically, the synthesis falls into 2 main reactions: (1) dehydrogenation of methane, ethane, etc., with superheated steam; (2) combination of the mol hydrogen with atmospheric nitrogen.

Raw gas from natural or refining supply is purified, including the removal of sulphur compounds by beds of zinc oxide. Desulphurized gas is sent to the mixing operation in which steam at 750° F is added to the stream of hydrocarbon (largely methane), and the mixture passes through reformer tubes containing an inert carrier, *e.g.* silica, with a thin deposit of nickel metal, the active dehydrogenating cat. Temp in the reforming furnace tubes or reactor vessel is 1350° F, at a pressure of a few lb. More than 90% of the methane is converted to CO_2 and H_2 in the first pass. In the final reforming step, air is added to convert any CO to CO_2 and to introduce nitrogen to the main reaction step. A flow chart of the major steps in the synthesis is given. G. H. G.

1120. Ethyl and *iso*propyl benzene, keystones of the petrochemical industry. P. W. Sherwood. *Industr. Chem. Mfr*, 1954, **30**, 25–8, 71–4.—95% of all the ethylene, and practic-

ally all of the propylene used in production of ethyl and *iso*-propyl benzene in the U.S.A., originate from petroleum. 110 million gal benzene (one-third of total production) produced from petroleum in 1953. Ethylene and benzene reacted in liq phase at low pressure and 90°–100° C in presence of $AlCl_3$ to give ethyl benzene, alternatively in vap phase at 900 p.s.i. and 325° C over phosphoric acid. *iso*Propyl benzene produced by similar methods, but cat in liq phase process is 88–90% H_2SO_4. Final purification of products by dist. Ethyl benzene is intermediate for production of styrene by direct dehydrogenation. *iso*Propyl benzene (cumene) was initially important as aviation gasoline component, but now mainly used for production of phenol and α-methyl styrene. A. C.

1121. New plant synthesis of phenol. Anon. *Petrol. Process.*, 1954, **9** (2), 238–41.—A new synthetic phenol plant is now in operation at Monsanto Chemical's West Coast, U.S.A., installation. Using benzene and sulphuric acid as raw materials, the plant produces phenol by the Dennis–Bull sulphonation process, with certain modifications. Capacity and cost of this new plant have not yet been disclosed by the company. J. W. H.

1122. Patents. U.S.P. 2,656,313 (10.5.49; 20.10.53). L. A. Miller, H. Dunn, and C. M. Neher, assrs to Ethyl Corpn. Photochemical production of benzene hexachloride.

U.S.P. 2,657,243 (15.9.48; 27.10.53). A. P. Giraitis and M. C. Fuqua, assrs to Standard Oil Development Co. The production of high quality *iso*propyl alcohol by hydration of propylene in the presence of sulphuric acid. D. A. R.

COAL, SHALE, AND PEAT

1123. Effect of fuel oil addition in coking. W. Ohme. *BrennstChemie*, 1953, **34** (21–22), 338–40.—Fuel oil *ca* 5% added to the oven charge increases yield of valuable products from the oil, and of coke. Increase of coke yield of 1·5–3·2% is attributed to decrease in amount of water of formation. Effect on economy of coke plant operation is illustrated. Operational data are shown in extensive tables. R. T.

1124. Patents. U.S.P. 2,654,695 (12.5.49; 6.10.53). W. I. Gilbert and C. W. Montgomery, assrs to Gulf Research and Development Co. Process for preparing liq hydrocarbon fuel from coal.

U.S.P. 2,656,308 (16.9.50; 20.10.53). E. S. Pettyjohn, assr to Institute of Gas Technology. Dist of oil-shale. D. A. R.

MISCELLANEOUS PRODUCTS

1125. Synthetic detergents. M. Fourniaud. *Parfum. mod.*, 1953, **45** (34), 55–64.—Brief survey, with emphasis on alkyl aryl sulphonates, preparation of which from petroleum is described. Main uses of alkyl aryl sulphonates are listed with particular reference to cosmetic applications. V. B.

1126. Spray drying of detergents. A. Sharphouse. *Soap, N.Y.*, Sept. 1953, **29** (9), 85.—Spray drying is briefly considered. Driers having airflow parallel to the fall of the product and low turbulence are considered best. Density of product is affected by inlet air temp, nozzle size, spray pressure, and exhaust air temp. M. V. J.

1127. Problem of oil gelification. J. Morelle. *Parfum. mod.*, 1953, **45** (34), 65–72.—Previous work of Licata (*cf.* Abs. **933**, 1938) is discussed in relation to the compounding of non-staining brilliantines. V. B.

1128. Some analytical problems in drying oil and resin research. N. W. Hanson. *J. Oil Col. Chem. Ass.*, March 1954, **37** (405), 143.—Problems encountered during research on drying oils and synthetic resins. Investigations made on them and results obtained are discussed. The problems are considered under the following headings (*a*) ring analysis by graphical–statistical methods; (*b*) the comparative analysis of some stand oils; (*c*) analysis of some newer drying oils or their fatty acids; and (*d*) measurement of unsaturation of some hydrocarbon resins. 9 literature refs. D. K.

1129. Evaluation of surfactants. J. E. Smallwood and S. L. Eisler. *Soap, N.Y.*, Aug. 1953, **29** (8), 48.—89 surfactants dissolved in Stoddard solvent were tested for water displacing properties using steel disks wetted with water containing 0·5 microcurie of $Na_2S^{35}O_4$ per ml. After immersion in surfactant soln and subsequent degreasing the disks were examined in a Tracerlab Automatic Scaling Unit. Surfactants were considered satisfactory if the net counting rate was less than 25% of that of the negative control (Stoddard solvent alone). 19 surfactants were satisfactory at 1 or 0·5% concn and a further 17 at higher concn. The percentage of successful anionics exceeded that of the cationics and nonionics. In some homologous series effectiveness increased with increasing mol. wt., whereas in others effectiveness decreased. All the sulphonates, except barium, were acceptable. 3 refs. M. V. J.

1130. Formulation of aerosol products. R. C. Downing and E. G. Young. *Soap, N.Y.*, Sept. 1953, **29** (9), 142.—After a brief survey of the aerosol market (133% more units were produced in 1952 than 1951) the author discusses the following aspects of aerosol formulation: (1) compatibility of propellent with base material and auxiliary solvents; (2) pressure—v.p. of Freon propellents and their mixtures, and mixtures of Freon 12 with various solvents are illustrated graphically; (3) spray character—mist and foam types are considered; (4) flammability—3 tests for determining flammability hazard are briefly described; (5) corrosion. M. V. J.

1131. Para and naphtha as closet fumigants. J. W. Arnold. *Soap, N.Y.*, Aug. 1953, **29** (8), 134.—Tests carried out to determine the efficiency of paradichlorobenzene (PDB) and naphthalene in controlling confused flour beetle adults, clothes moth, and carpet beetle larvæ are reported. It was concluded that low vapour pressure and low toxicity make naphthalene unsuitable, but that PDB is effective providing it is properly employed, *i.e.* not less than 1 lb/cu. ft. should be well spread out at the top of the closet, which should remain closed for one week. The use of a heat-vaporizer unit or air circulation is recommended for producing a high vapour concn rapidly. 9 refs. M. V. J.

1132. Germicides for soap. W. Innes. *Soap, N.Y.*, Sept. 1953, **29** (9), 42.—The published data concerning D.C.M.X. and hexachlorophene as soap germicides are critically reviewed. The reported results of *in vitro* tests using D.C.M.X. are fairly consistent, whereas those concerning hexachlorophene show considerable variation. Practical handwashing trials show both germicides to be effective. 11 refs. M. V. J.

1133. Colorimetric determination of EDTA in soaps and detergents. A. Darbey. *Soap, N.Y.*, Aug. 1953, **29** (8), 81.—The application of a previously described method, based on the formation of a nickel–EDTA complex and subsequent determination of nickel as red nickel dithio-oxalate, to the estimation of EDTA (ethylenediamine tetra-acetic acid) in soaps and detergents is reported. Detailed procedure is given for analysis of EDTA in sodium stearate, sodium stearate–synthetic detergent mixtures, potassium coconut fatty acid soaps, and triethanolamine coconut fatty acid soaps. 13 refs. M. V. J.

1134. The effect of some physical properties of nitrocellulose on lacquer performance. W. A. Caldwell and J. J. Creasy. *J. Oil Col. Chem. Ass.*, Feb. 1954, **37** (404), 63.—Some aspects discussed are visc–mol. wt. relationships and the effect of visc of nitrocellulose on lacquer composition. Properties of nitrocellulose considered are: relative durability of various grades, and effect of nitrogen content. D. K.

1135. Phenolic disinfectants. J. L. Boyle. *Soap, N.Y.*, Aug. 1953, **29** (8), 129.—The properties of phenolic prepara-

tions used for general sanitation are discussed. The 3 types considered are : (1) saponated cresol (50% cresol in soap base solvent), which is cheap, has a wide range of activity, but is irritating to the skin ; (2) chloroxylenol preparations which are innocuous to the skin but limited in activity against staphylococci and *Ps. pyocyanea* ; (3) selected fractions of coal tar phenols and synthetically prepared homologues such as octyl cresol. 5 refs. M. V. J.

1136. New drying oils produced by solvent segregation. F. J. H. Le Riche and A. L. Stubbs. *J. Oil Col. Chem. Ass.*, Jan. 1954, **37** (403), 8.—The production of drying oils by solvent segregation is discussed with particular reference to the "Solexol" process. This process is based on the selective solvent action of liq propane at temp near its critical temp. The properties of some oils so produced are presented. D. K.

CORROSION

1137. Co-ordination of corrosion control. H. L. Hamilton. *Pipe Line News*, Dec. 1953, **25** (12), 44–8.—A discussion of the adverse effects on neighbouring underground installations, caused by indiscriminate planning of cathodic protection. Stress is laid on the need for consultation with the owners of nearby plant when installing or making alterations to protection equipment. S. R. H.

1138. Economics of corrosion control. A. W. Peabody. *Pipe Line News*, Feb., 1953, **25** (2), 44–7.—Stress is laid on the importance of designing against corrosion. Distribution systems can best be protected by the elimination of all dissimilar metal contacts by means of electrical insulating couplings and fittings. The use of a coating, together with cathodic protection, is recommended for the whole of underground pipeline systems. S. R. H.

1139. New techniques—current problems in controlling corrosion. O. C. Mudd. *Pipe Line News*, Jan. 1954, **26** (1), 44–8.—Cathodic protection currents conserved by galvanizing steel rods of electrical ground beds and by use of galvanized steel plates under reinforced structures. Electrical current drainage bonds between underground structures equalize protection and reduce damage to nearby unprotected structures. S. R. H.

1140. Corrosion for pipeliners. S. Thayer. *Pipe Line News*, March 1953, **25** (3), 21–2 ; Apr. 1953, **25** (4), 44–7 ; May 1953, **25** (5), 31–8 ; June 1953, **25** (6), 34–7 ; July 1953, **25** (7), 40–4 ; Aug. 1953, **25** (8), 39–41.—A series of articles dealing with the elementary theory of steel corrosion and the properties of good protective coatings, such as hot and cold enamels, and the possible future use of plastics. The relative merits of sacrificial and power unit cathodic protection and the practical application of these methods are given. S. R. H.

1141. Combating corrosion. Various. *Oil Gas J.*, 15.2.54, **52** (41), 122.—Papers by 19 leaders in the field of corrosion mitigation are presented. Subjects dealt with include use of paint in corrosion-mitigation, asphalts as coatings, organic inhibitors, microbiological corrosion, impressed current cathodic protection, electrochemistry of corrosion, and design to prevent corrosion. G. A. C.

1142. How chemical cleaning makes money. J. T. Browning. *Petrol. Refin.*, 1954, **33** (2), 131–2.—A description of the methods used to remove tightly adhering layers of iron oxide from a toluene plant after 6 years disuse. The system was first soaked in a suitable solvent, then washed with water, and finally passivated by means of a 1% soln of phosphoric acid. R. D. S.

1143. Laboratory investigations on corrosive action of engine oils on bronze bearings. Z. Stepek. *Bull. Polish Inst. Petrol.*, 1953, **3**, 10 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—On apparatus built by the Polish I.P. according to Pinkiewicz several Polish engine oils were tested for their actions on various alloys. Later the same oils were tested with inhibitors AZNII 4 (from U.S.S.R.), Paranox (U.S.A.), Hyco (Dutch), and Universal (Polish). Good effects were observed. M. S.

1144. Final report on the field exposure test conducted by the IP Protective's Panel. Anon. *J. Inst. Petrol.*, 1954, **40**, 32–6.—Mild steel panels coated with various types of protective were exposed at a number of sites having widely divergent atmospheric conditions. Whereas the environment played a large part in deciding the rate of failure of the protectives, it did not affect materially the order in which they failed. A. R. W. B.

ENGINES AND AUTOMOTIVE EQUIPMENT

1145. American engines. Anon. *Auto. Engr*, Feb. 1954, **44** (2), 74.—Brief descriptions of the Ford, Buick, and Packard engines for 1954 production are given. T. T.

1146. Petrol injection. Anon. *Auto. Engr*, Feb. 1954, **44** (2), 61.—The system described and illustrated is for use with single-cyl engines, but schemes have been prepared for multi-cyl units. The injector is operated by a gas bleed from the cyl head, and during compression and power strokes high gas pressure acts against a spring-loaded plunger and piston unit, fuel being drawn into a small chamber. When the cyl pressure falls, the plunger and piston are forced forward by the spring, and fuel is injected into the induction tract, with an injection pressure of 300 p.s.i. Fuel feed to the injector is arranged by gravity feed, fuel pump, or pressurized tank. Application of the system is discussed. T. T.

1147. A theory of vortex combustion chamber design. Pt 2. H. A. Havemann. *J. Inst. Fuel*, Jan. 1954, **27** (156), 25.—Vortex entry is discussed. Vortex combustion chamber design and problems associated with combustion in the chamber are considered. D. K.

1148. The Cummins diesel engines. Anon. *Auto. Engr*, Feb. 1954, **44** (2), 63.—Details of a series of 13 high-output, 4-stroke engines for commercial vehicles are given. All but one are 6-cyl engines, and the majority can be supplied with superchargers. Outputs range from 100 to 300 b.h.p. The Cummins single-plunger metering pump fuel injection system is described. Development of a standard 150-b.h.p. engine for racing purposes enabled the max output to be increased to over 350 b.h.p. T. T.

1149. Operation of a marine gas turbine under sea conditions. J. Lamb and R. M. Duggan. *Trans. Inst. Mar. Engrs*, Dec. 1953, **65** (12), 277.—The paper describes in detail the results obtained over a period of 2 years with the first gas turbine to be used for the propulsion of a merchant ship. After giving the reasons for installing the turbine and briefly describing the machinery layout in the ship, the authors outline the general performance of the turbine set under varying sea and atmospheric conditions. Each component is then dealt with separately, the methods adopted to maintain each in an efficient condition and the effect of salt in sea air upon the compressors, and fuel ash upon turbine blading, are described. Particulars are given of all mechanical defects encountered, together with a detailed description of the nature and extent of blade corrosion. The paper contains information regarding the heat-resisting properties of special steels employed and of the composition of deposits found in the h.p. turbine and heat exchanger. Mention is made of the steps taken to adjust the length and shape of the flame in order to avoid parts of the combustion equipment burning away. The importance of grit-free fuel is stressed, and the measures taken to ensure this are given, as well as the results obtained in burning fuels ranging in visc from 40 to 1500 sec Redwood I at 100° F. T. T.

SAFETY PRECAUTIONS

1150. Carcinogens in bitumen and soot. F. Braukmann. *Erdöl u. Kohle*, 1953, **6**, 804–6.—Literature review, including a tabulation of the carcinogenic properties of hydrocarbons. 12 refs. V. B.

1151. Intrinsically safe measurement and control circuits in explosive areas. W. Wäller. *Erdöl u. Kohle*, 1953, **6**, 793–5.—Intrinsically safe circuits should not carry more than 1 W ascribable to non-ohmic resistance. Examples are described of electronically operated equipment, complying with such requirement, for intercommunication and level control. In latter case, if resistance through material is >1 megohm, capacity-regulated circuits should be used. V. B.

MISCELLANEOUS

1152. Engines, fuels, and lubes. What's ahead? Anon. *Petrol. Process.*, 1954, **9** (2), 207.—By 1957–58 2 developments in the oil and automobile industries seem certain; engines will be operating with 10 : 1 C.R. and at the same time using fuel of 98 O.N. rating. The production of 98 O.N. fuel by cat reforming will actually mean a saving of *ca* 7·7% in the amount of crude oil required to produce a specified volume of gasoline. J. W. H.

1153. The oil wheel of fortune. H. J. Struth. *J. Petrol. Tech.*, Aug. 1953, **5** (8), 11–13.—In 1952 in the U.S.A. the oil industry gross volume of business was $17,000,000,000, being third to agriculture and public utilities. The expenditures in millions of dollars were 3458 salaries and wages, 1386 leases and royalties, 6056 goods and services, 1700 capital charges, 2000 direct taxes, and 1080 dividends. $1,320,000,000 was available for re-investment. Direct employment is provided for 1,426,500 persons, and primarily because of oil there are other industries employing 5,991,300 persons. Oil products in 1952 were 2,824,515,000 brl.

There are now 53,000,000 motor vehicles in the U.S.A., 21,000 diesel locomotives, and 4,500,000 tractors on farms. 6,500,000 homes are heated by oil.

The pay rolls are $1,771,581,000 drilling and production, $1,336,000,000 refining and processing, $350,000,000 oil pipelines, $1,350,000,000 marketing.

For every net brl of oil produced the industry spent $1.01 for exploration, $0.58 for development, and $0.75 for production. The net return of the average oil well was only $875. 187,000,000 ft of hole was drilled, including 19,350 exploratory wells (1640 successful). All wells totalled 45,920 in 1952.

For each brl of reserves found in new fields 3·1 brl were added by extensions in old fields. For every brl produced in 1952 1·72 brl were found. At the end of 1952 484,600 wells were producing. G. D. H.

1154. Imports 13·2 per cent of total U.S. demand. H. D. Ralph. *Oil Gas J.*, 15.1.54, **52** (38), 142.—Tables show import–export trends and crude imports by country of origin. G. A. C.

1155. Natural-gas-liquids gain below 11-year average. J. C. Casper. *Oil Gas J.*, 25.1.54, **52** (38), 148.—Tables show product output at natural gasoline and cycling plants in 1953, total plant production by years, and product output by years. G. A. C.

1156. Refinery runs top 7,000,000 brl daily. Anon. *Oil Gas J.*, 25.1.54, **52** (38), 146.—Tables show refinery yield trends from 1938 to 1953 and runs by districts. G. A. C.

1157. Report on United States operating refineries. Anon. *Oil Gas J.*, 22.3.54, **52** (46), 233.—The refineries are listed by states, together with their capacities, types of processes, and products. G. A. C.

1158. Report on Canadian operating refineries. Anon. *Oil Gas J.*, 22.3.54, **52** (46), 256.—The refineries are listed by states, together with their capacities, types of processes, and products. G. A. C.

1159. Largest British refinery building rapidly. A. E. C. Drake. *Petrol. Engr*, Sept. 1953, **25** (10), C39–40.—Report on the progress made on the 100,000-b.d. refinery at Aden. G. H. G.

1160. Expansion of Australian refining capacity. H. B. Fletcher. *Petrol. Engr*, July 1953, **25** (7), C7–10.—The existing refining plants with their capacities, provide at present 15% of the natural consumption. By 1955, production should satisfy 86% of the requirements. The refineries under erection, together with their different units and capacities, are dealt with. G. H. G.

1161. Assembly of an analytical card index on oil and gas accumulation. J. Guibert. *Rev. Inst. franç. Pétrole*, Jan. 1954, **9** (1), 18–30.—Oil discoveries in recent years in France and French possessions has raised various problems. In order to solve these an analytical card index of world-wide oil and gas occurrences has been compiled so that the results of experience obtained elsewhere may be readily available to the French oil industry. The cards carry essential data on the reservoir rock, oil and gas, well completions and spacing, mode of production, etc., and are so designed that by suitable notching marking given features they can be readily grouped and segregated according to the information required. The cards are arranged alphabetically under countries, and then fields.

Brief notes are given on the various oil and gas fields of Western Europe, illustrating the salient points which can readily be card indexed.

Illustrations giving actual cards, and a map showing the European oilfields are included. G. D. H.

1162. How a contractor affects company relations with landowners. C. A. Lingo. *Pipe Line News*, Feb. 1953, **25** (2), 25–6.—Cordial relations can be maintained between pipeline contractors and landowners by strict observance of agreement and by minimizing the inconvenience caused to the landowner during operations. S. R. H.

1163. The residual fuel problem. G. Webber. *Oil Gas J.*, 22.3.54, **52** (46), 138.—Under this heading the author discusses heavy fuel oil, asphalt, and petroleum coke mostly from an economic angle. It is suggested that the yield of heavy fuel oil must be reduced, as it is in the by-product class, whilst there is always likely to be a strong demand for asphalt because of increase in road building and water reclamation. Petroleum coke is now a vital ingredient in the manufacture of aluminium. G. A. C.

1164. The Ceramic Drying Conference, 1953. Various. *J. Inst. Fuel*, March 1954, **27** (158), 114.—One-day conference held at Stoke-on-Trent on 22 April 1953. S. R. Hind opened the conference, and his speech, together with the 4 papers read, is reproduced. The papers were entitled: Drying in Tile Manufacture, L. Bullin; Notes on the Efficiencies of Ceramic Driers, J. S. Jones; Jet-drying of Ceramic Clayware and Dipped Ware, A. J. Dale and G. W. Bird; Drying of Sanitary Earthenware, A. J. Dale and J. A. Johnson. D. K.

1165. Mechanical handling in the petroleum industry. E. A. Reynolds and V. F. H. Samson. *J. Inst. Petrol.*, 1953,

39, 795–814.—The salient requirements for handling equipment, lines, and products during all stages of refinery operations are brought out. Brief details of types of handling equipment in common use are given. A. R. W. B.

1166. Radioactive tracers in insecticide research. Pt I. P. A. Dahm. *Soap, N.Y.*, Sept. 1953, **29** (9), 136.—The basic principles and applications of radiochemistry are discussed. M. V. J.

1167. United Kingdom petroleum legislation in 1953. V. Biske. *Petrol. Times*, 19.2.54, **58** (1475), 170.—This review of petroleum legislation includes taxation, control and safety of conveyance, Customs regulations, trade disputes, and certain judicial decisions. G. A. C.

1168. The conservation of the nation's fuel and power resources. F. M. H. Taylor. *J. Inst. Fuel*, Feb. 1954, **27** (157), 79.—The results are presented of an investigation into the ways in which better use could be made of the nation's fuel and power resources, taking into account present and probable consumption and likely technical developments. Main sources of information are listed. D. K.

1169. The effects of smoke pollution on health. S. I. A. Laidlaw. *J. Inst. Fuel*, Feb. 1954, **27** (157), 96.—The effects on health of the diminution of sunlight due to impurities in the air; the solid impurities, dust, soot, fog, and gaseous impurities, SO_2, F, CO, beryllium compounds, and tobacco smoke are discussed, with reference to the diseases which could be caused. Possible causes of bronchial carcinomas are considered. D. K.

BOOK REVIEWS

Guide du Pétrole, 1953–54. O. Lesourd. Paris: Editions O. Lesourd, 1953 (21st edition). Pp. xxxvi + 1004 + 128 + appendix (40). Frs. 5500.

This voluminous, conveniently thumb-indexed, annual publication is a comprehensive source of information on all non-technical aspects of the French petroleum industry. The book is divided into six parts, followed by a buyer's guide and an appendix giving useful telephone numbers.

The first part deals with official regulations governing the industry, and is by far the largest, extending to over 500 pages. We may sometimes feel in the U.K. that we are over-governed. By comparison with the " réglementation " controlling the French petroleum industry, the extent of legislation dealing with oil in the U.K. may be considered as almost trivial. Among aspects where the French are subject to a legal control not applicable here may be mentioned price and quality specifications for many of the products, including a maximum upper limit for the O.N. of premium grade gasoline (87 Research) as well as a, more understandable, minimum limit (80).

There is a useful statistics section; as an example of some of the detailed information available therein the number of filling stations in each department of France is given, and also the number of motor fuel pumps available, divided as to regular, premium, and diesel grades.

The section dealing with operating companies is grouped under subject heads such as production, refining, importation, etc. A list of trade names is given in this edition, for the first time since pre-war days. There is a " Who's who " section for the French industry and a very brief description of refining processes; this is followed by a petroleum glossary, including English equivalents of French terms; the glossary has been adapted from the corresponding IP publication. It should be noted that " vaseline " is not, contrary to what is stated, the English equivalent of the same French word; in the U.K. the term is a proprietary one.

The last, separately paginated, section of 104 pages is a buyer's guide.

This book should give the answer to anyone with a query covering the legal or commercial aspect of petroleum in France or French overseas territories. V. B.

Physical Constants of Hydrocarbons. Vol. V. Paraffins, Olefines, Acetylenes, and other Aliphatic Hydrocarbons (Revised Values). Gustav Egloff. American Chemical Society Monograph No. 78. New York: Reinhold Publishing Corpn, 1953.

The physical and thermodynamic properties of hydrocarbons have been the subject of much intensive documentation work during the past twenty years. The large number of hydrocarbons now actually known and the vast numbers which may possibly occur or be prepared make the task of collecting and collating the data one which must become even more formidable each year. The chemist, physicist, and chemical engineer should be grateful to those who have been responsible for the production of such volumes as the U.S. Bureau of Standards Circular No. 500 on " Selected Values of Chemical Thermodynamic Properties," the API Project No. 44 " Selected Values of Physical and Thermodynamic Properties of Hydrocarbons and Related Compounds," and to Dr Egloff for the series of volumes on " Physical Constants of Hydrocarbons," of which the book under review is one.

Work on the physical constants of hydrocarbons was commenced by Dr Egloff and his colleagues in the early 1920s, but it was not until 1939 that the first volume (covering the paraffins, olefins, and acetylenes) of the A.C.S. Monograph appeared. This was followed by the volume on Alicyclic Hydrocarbons (1940) and then, after an interval due to war, by the volumes on Mononuclear Aromatics (1946) and Polynuclear Aromatics (1947).

A great deal of new information has become available in the fifteen years since Vol. I appeared, and the decision has been made to revise the earlier volumes to include this new material; Vol. V is the first of these supplementary volumes. Some idea of the amount of new data is given by the 250 values quoted for the boiling point of *n*-heptane over the pressure range from 0·1 to 20,000 mm; Vol. I listed only 29 values over the range 41 mm to atmospheric. It is interesting to note also that (excluding optical isomers) the number of nonanes recorded has increased from 16 in Vol. I to 33 (of a possible 35) in Vol. V; of decanes from 17 to 42 (possible 75), and of hexadecanes from 6 to 11.

The arrangement of the tabulated data has been changed from the six-column format of Vol. I to a two-column page. The alteration is probably dictated by the necessity to economize in space, but at first glance the new form is a little less convenient for quick reference. The properties listed are again the m.p., b.p., Density, and Refractive Index, with some additional data, such as critical temperature and pressure and equations for variation of properties with temperature, etc., included when available. " Best Values " for the properties are given where possible, and these are the figures to which reference will most often be made. The treatment of hydrocarbon data in the monograph contrasts strongly with that followed by Rossini in the API Project 44 publication. In the latter, selected data are given for ready reference, the selection having been made by the workers on the project. A wide range of properties is covered. Egloff follows the system of completely recording the values obtained by all workers on a limited number of properties. The user of the book can, if he desires, re-evaluate a " best value " using the very comprehensive references. In most cases, probably, he will be content with the " best value " quoted unless engaged in a detailed study of some particular hydrocarbon or hydrocarbons. In the latter case the detailed references to individual sources are invaluable.

Vol. V supplements Vol. I; it does not entirely replace the earlier compilation. By itself it is a valuable source of information, but it is obviously desirable that it should take its place on shelves already carrying Vols. I–IV. All those interested in hydrocarbons will hope that further revised volumes, covering the other classes of hydrocarbons, will soon be added. E. B. E.

Houben–Weyl Methoden der Organischen Chemie. Vol. II. Ed. E. Muller. Stuttgart: Georg Thieme Verlag. 1953. Pp. 1070. DM. 139.00.

Houben–Weyl, after its first appearance in 1909 was, for many years, the standard reference book on the general methods of organic chemistry. In spite of considerable revision in the second and third editions, it became outdated and failed to retain its position as an authoritative work. The present edition, which has been completely rewritten, restores Houben–Weyl to its former position. This volume, the second of the new series, deals exclusively with analytical methods, including elementary analysis, qualitative and quantitative carbon analysis, and, finally, gas analysis. Considerable space is devoted to methods for the accurate determination of physical properties. The chapters are by themselves complete monographs by well-known authorities, and are sufficiently detailed to enable the determinations described to be successfully carried out by the average chemist.

The book is excellently produced with the good, clear printing which has always been associated with the more important German scientific works. Houben–Weyl is probably unknown to the younger generation of chemists, who are recommended to make themselves familiar with it and to take advantage of the wealth of information which it contains. The chapter on sulphur compounds is of particular interest to the petroleum chemist. S. F. B.

Lehbruch der Organischen Chemie. P. Karrer. Stuttgart: Georg Thieme Verlag, 1954. Pp. 949. DM. 59.70.

Karrer is too well known to need introduction. Since the first edition appeared in 1927 it has been one of the outstanding text-books on organic chemistry. Intended originally for students, it has become a valuable source of information for chemists in general. Frequent revision (the present volume, the twelfth German edition, covers the literature up to 1953), so necessary in view of the rapid developments which have occurred in many relatively new fields, greatly enhances its value. In the present edition a number of important changes have been made and sections modified; more space has been allotted to reaction mechanisms and electronic theory.

To the chemist with little knowledge of German, the English translation—now in its fourth edition from the German eleventh—will no doubt be of greater value. The original German is, however, more up-to-date, especially in the sections dealing with high polymeric materials, etc.

The book is well-produced and clearly printed; in comparison with other works of this nature it is not expensive. S. F. B.

ADDITIONS TO THE LIBRARY

Distillation Literature Index and Abstracts, 1946–52 Inclusive. Arthur and Elizabeth Rose. State College, Pennsylvania: Applied Science Laboratories Inc., 1953. $25.00.

This book of several hundred pages is a complete guide to published literature on the subject of distillation covering the years 1946–52. The bulk of the book consists of abstracts which are arranged under subject classifications, these being in alphabetical order and adequately cross-referenced. For a quick indication of the contents, there is a list of subject headings in the first few pages, and a complete author index is available.

As a reference book the value of the book is considerable.

World Petroleum Statistics. Monthly. U.S. Dept of the Interior, Bureau of Mines.

Table 1. World supply and demand—crude petroleum. Table 2. Production of refined products by countries. Annual issue gives also: Table 3. Bunker oil deliveries to vessels engaged in international trade. Table 4. Estimated domestic demand for major products.

World Road Statistics, 1953. International Road Federation. London: The Federation, 1953. Pp. 122. 12*s.* 6*d.*

Information concerning taxation of road vehicle fuels in all countries.

Sexta Reunión Anual del Asfalto. Comision Permanente del Asfalto. Buenos Aires: The Commission, 1954. Pp. 503.

Report of a conference held in April 1952 and containing the papers read and an account of the discussion.

X-ray Diffraction Patterns of Lead Compounds. Chester: The Shell Petroleum Co. Ltd., 1954. Pp. 81. (For private circulation.)

A systematic presentation of X-ray diffraction patterns of lead compounds studied at Thornton Research Centre in relation to deposits in engines using leaded fuels.

Statistical Summary of the Mineral Industry, 1946–52. London: HMSO, 1954. Pp. 347. 27*s.* 6*d.* net.

This latest annual publication of the statistics compiled by the Mineral Resources Division of the Colonial Geological Surveys covers the seven years 1946–52. In the petroleum section there are world details of refinery output, exports and imports of crude and refined products, and crude petroleum production. Figures are also given for production of natural gasoline, natural gas, asphalt rock, natural asphalt, and oil shale. This book is a useful source of comparable figures.

BS 1991: Part 1: 1954. Letter Symbols, Signs and Abbreviations. Pt. I. General. Pp. 45. 6*s.* net.

In 1934 the BSI issued a standard (BS 560) on engineering symbols and abbreviations and, in 1938, a similar standard (BS 813) covering the chemical field. When the need for revision arose, it was decided to combine the two standards and to provide one standard which would not only make recommendations for a wide range of quantities but which would also give guidance towards the development of a general system.

ASTM Standards on Engine Antifreezes. ASTM Committee D-15. Philadelphia, Pa.; American Society for Testing Materials, 1953. Pp. 48. $1.25.

Includes all ASTM methods of test pertaining to engine antifreeze covering sampling and preparing aqueous solutions for testing purposes; freezing point of aqueous solution; physical tests for boiling point of engine antifreezes, and specific gravity of concentrated engine antifreezes by the hydrometer; chemical tests for ash content, reserve alkalinity, pH of concentrated engine antifreezes, and water in concentrated engine antifreezes by the iodine reagent method.

Selection and Use of Engine Antifreezes. ASTM Committee D-15. Philadelphia, Pa.; American Society for Testing Materials, 1952. Pp. 16. $0.40.

Provides information and advice on engine cooling system antifreezes and corrosion inhibitors. The detrimental

effects which can occur when improper antifreezes are used are discussed, and there are a number of illustrations showing the results of the use of faulty antifreezes on engine parts.

Report on the Principles Involved in the Determination of Absolute Viscosity. W. H. Markwood (Ed.). Philadelphia, Pa.; American Society for Testing Materials, 1953. Pp. 36. $1.00.

ASTM Committee E-1 on Methods of Testing assigned the Task Group on "Methods and Apparatus for Absolute Viscosity Measurements" of Sub-committee 9 on Rheological Properties the job of preparing a report containing simplified discussions of the various principles by which viscosity may be determined in absolute units, and to describe several viscometers that illustrate these principles. Published originally in the 1951 *ASTM Proceedings*, Vol. 51, the report is intended as an introduction to rheology from a practical point of view resting on a sound theoretical base. It is illustrated with drawings, sketches, and photographs, and includes a list of 74 literature references.

1953 Supplement to Book of ASTM Standards including Tentatives.

Part 1. Ferrous Metals. Pp. 363 + xiii.
Part 3. Cement, concrete, ceramics, thermal insulation, road materials, waterproofing, soils. Pp. 383 + xiii.
Part 5. Fuels, petroleum, aromatic hydrocarbons, engine antifreezes. Pp. 332 + xii.

British Standards.

B.S. 327 : 1954. Part 2. Derrick Cranes (Hand-Operated). Pp. 45. 6*s*. net, post free.

B.S. 336 : 1954. Fire Hose and Suction Hose Couplings, Branch Pipe and Nozzle Connections. Pp. 27. 4*s*. net, post free.

B.S. 791 : 1954. Calorimeter Thermometers (excluding Gas Calorimeter Thermometers). Pp. 9. 2*s*. 6*d*. net, post free.

B.S. 1428 : 1954. Part E2. Micro-Beakers. Microchemical Apparatus Group E : General Accessory Apparatus. Pp. 6. 2*s*. net, post free.

B.S. 2051 : 1954. Part 2. Olive, Soldered Nipple, and Flared Types of Copper and Copper Alloy Tube Fittings (for use with Fractional O.D. Sizes of Tubes) for Engineering Purposes. Pp. 98. 12*s*. 6*d*. net, post free.

B.S. 2071 : 1954. Soxhlet Extractors. Pp. 11. 2*s*. 6*d*. net, post free.

B.S. 2079 : 1954. Steam Receivers and Separators. Pp. 84. 12*s*. 6*d*. net, post free.

B.S. 2096 : 1954. Method of Testing Oil-Fired Rotary Dryers for use in Asphalt and Coated Macadam Plant. Pp. 12. 2*s*. 6*d*. net, post free.

B.S. 2451 : 1954. Chilled Iron Shot and Grit. Pp. 6. 2*s*. net, post free.

B.S. 2452 : 1954. High Pedestal or Portal Jib Cranes. Pp. 53. 7*s*. 6*d*. net, post free.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1170. Petroleum geology of Oklahoma. C. Millison. *Petrol. Engr*, Dec. 1953, **25** (13), B93.—The petroleum geology and producing potentialities of Oklahoma are described in detail. To enable description in summary form the state is divided into 7 different districts that contain similar structural features and producing horizons. These are NE. Oklahoma, McAlester Basin, Central and North Central Oklahoma, Seminole flexure, South Central Oklahoma, SW. Oklahoma, and Anadarko Basin.

The geology is complicated and producing zones are numerous. Structures range from monoclinal dips to overturned normal faults and recumbent folds with complex fault patterns. Producing zones range from Cambro–Ordovician to Cretaceous, from sandstones to porous dolomites and biostromal limestones.

Unlike other states which are a simple structural province, Oklahoma has 4 different mountain systems within its borders. The effect that these mountains (Ozark, Ouachita, Arbuckle, and Wichita) have had on the structure and stratigraphy is one of the principal reasons Oklahoma has become an important oil producing state.

Article includes sections and maps. W. S. R.

1171. Northern Anadarko Basin shelf. R. R. Wheeler. *Petrol. Engr*, Dec. 1953, **25** (13), B89.—Structural and stratigraphical evidence has been advanced for designating a Northern shelf of the Anadarko Basin. Sub-surface studies indicated many similarities to the broad producing expanse of the Central Oklahoma Platform.

Exploration work has provided some information which supports this view, but a recent multiple pay discovery in the Simpson Grant County added further information. Wells indicate that oil and gas are present in the mid-Mississippian lime, Viola dolomite, Simpson dolomite, First Wilcox sand, and Arbuckle dolomite. Thus commercial oil and gas possibilities have been indicated in the Arbuckle of NW. Oklahoma whilst Simpson production has been extended 60 miles along the Oklahoma–Kansas boundary.

Structural information indicates that the Northern shelf is not merely an extension of the Central Oklahoma Platform, but reflects the influence of southward plunging axes of the Central Kansas Uplift.

Seismic mapping has been hampered by the difficulty of obtaining reflections from beneath the thick Mississippian lime and, partly, the Permian evaporite section. W. S. R.

1172. Lower Cretaceous in Alberta and Saskatchewan. A. W. Farmilo. *World Oil*, Dec. 1953, **137** (7), 282.—In general, the Lower Cretaceous of W. Canada consists of interbedded shales, sandstones, conglomerates, and coals. The Lower Cretaceous lies unconformably on the Jurassic and Palæozoic strata. Most of the Lower Cretaceous sand accumulations are found in stratigraphic type reservoirs; structure appears to play a minor role.

Horizons of interest are: (1) Viking Sand—is a fine to coarse quartz sand with black chert grains often containing glauconite, in places becomes shaly or silty and this is evidently responsible for many oil and gas accumulations; (2) Mannville (Blairmore)—light grey, fine grained and composed of clear quartz grains, some chert and other minerals; (3) Glauconite, Basal Sand—known by a variety of local names, McMurray, Bluesky, Ellerslie, Centaur, Roseray, and Fosterton. Outstanding feature of many basal sand fields is the presence of a thick active gas cap in relationship to a thin oil column of 10–15 ft or less. These beds present many engineering problems due to this large gas cap.

The author describes in detail the lithology, structure, and relationship of each formation. W. S. R.

1173. Will Saskatchewan discover its own Leduc? F. H. Edmunds. *World Oil*, Dec. 1953, **137** (7), 271.—The discovery of medium and light gravity oils in 1952 and the proving of considerable reserves of medium oil in 1953 have increased the importance of Saskatchewan as an oil producing province. Prior to this only heavy oil had been produced—in the Lloydminster area.

Recent discoveries have been principally in the Jurassic of the SW. and the Mississippian of the SE. Both the Jurassic and Mississippian are truncated on the flanks of the Williston Basin. The extension in Saskatchewan of this basin is known as the Moose Jaw Basin, the regional structure being one of dip to the S. and SE., towards the basin.

In the Lloydminster area the Jurassic and Mississippian are absent, the Lower Cretaceous lying directly on the Devonian. Cretaceous beds that are of most interest are the Viking of Lower Colorado age and a number of sands of the Lower

Cretaceous. The Viking, though not well developed at Lloydminster, is important in the Coleville and Brock area.

The Tioga and Beaver Lodge fields illustrate the commercial importance of the Mississippian. Oil bearing beds include the Mission Canyon.

Oil shows have been found in the Devonian, Silurian, and Ordovician, but, as yet, no commercial indications. The upper part of the Devonian, so productive in Alberta, is missing in Saskatchewan. It is thought, however, that the 1800-ft section of Devonian may yield oil after complete exploration.

Article includes a stratigraphic correlation of Saskatchewan areas. W. S. R.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1174. New oil finding method tested. R. B. Pratt. *World Oil*, Nov. 1953, **137** (6), 98.—A method by which direct evidence of an oil accumulation is indicated on radio transmission curves has been developed and field tested with satisfactory results. The presence of an oil accumulation is shown by anomalies on the edge of the transmitter curves, the receiver readings being taken across the edge of the oil deposit.

The equipment consists of a transmitter and a receiver. The transmitter generates electromagnetic waves at a constant frequency and amplitude. The receiver antenna is a square loop, and is levelled and oriented in line with the transmitter by a compass. Whilst in operation the transmitter remains fixed in position for each separate profile, and the receiver occupies successive stations along a straight traverse directed away from the transmitter. Profiles are very similar to refraction profiles in length and number of stations.

Article also describes, in detail, the collection and interpretation of data.

Numerous diagrams and profiles are given. W. S. R.

1175. Airborne magnetic surveys. S. K. Runcorn. *Nature, Lond.*, 1954, **173**, 281–3.—Report of a discussion of the Royal Astronomical Society, London, November 1953.

The use of a " fluxgate " measuring element for use in aircraft is described. It is thought that, since there is no certainty of interpretation, the value of the airborne magnetometer is regarded too optimistically in the U.S.A. On the other hand, one speaker considered that airborne observations agree well with land observations made on the same regions.

A description of the execution of an aerial magnetic survey is given in detail. The technique is to fly a series of lines (control lines) around a network of fixed magnetic values, which act as datum values for the readings on the flight lines themselves. To allow the diurnal drift of the field to be calculated, the aircraft flies over these points at least twice within *ca* 10 minutes. H. C. E.

1176. European Association of Exploration Geophysicists. T. C. Richards. *Nature, Lond.*, 1954, **173**, 246.—Report of the fifth meeting in Milan, December 1953. Of the 22 papers presented, 11 were on seismic, 6 on gravity, 3 on electrical, one on magnetic, and one on general problems in exploration geophysics. None was concerned specifically with oil prospecting. H. C. E.

1177. Surface minerals reveal Michigan structures. B. H. Lasky. *World Oil*, Dec. 1953, **137** (7), 100.—Method is based upon the discovery by the author that the sediments which are clays, or which consist for the most part of clay minerals, have been subjected to alteration at the surface, and that this alteration is regional, and also a function of the sub-surface structural relief.

Technique involves the collection of samples at a depth of *ca* 4 ft. Samples are then analysed for amounts of certain critical minerals. The differentials in these control minerals are then plotted with respect to the location of the sample stations. Profiling, in which samples are taken every ¼ or ½ mile apart, is generally adequate for preliminary survey. Conventional use of the technique involves the preliminary determination of the relationship between the alteration data and a sub-surface condition for any given area. Critical mineral parameters are then indicated.

Recently the method was used in the Michigan Basin, the survey being carried out with no previous information available to the author, nor was the location of the survey known to him. Only at a later date was he informed that the samples represented a continuous profile across the Michigan Basin.

Results of the survey showed favourable structures where several oil fields are situated, Reed City, Cedar, Evart, and Sylvan, whilst at East Reed City field no anomaly was shown. This field is due to a stratigraphic trap.

The article includes several diagrams which illustrate the results of the survey. W. S. R.

1178. Analyses of crude oils from some Oklahoma fields. C. M. McKinney and E. L. Garton. *Petrol. Engr*, Dec. 1953, **25** (13), A50.—Tabulated data are given for 61 analyses of crude oils from Oklahoma fields. Complete Bureau of Mines routine analyses are given for 4 of the oils. Also included are a brief discussion of the Bureau of Mines analysis, correlation index curves for several Oklahoma crude oils, and a list of references to articles that include analyses of Oklahoma crude oils. W. S. R.

1179. Patents. U.S.P. 2,661,464 (8.4.49; 1.12.53). A. Wolf, assr to Geophysical Research Corpn. Method and apparatus for recording dip of geological strata.

U.S.P. 2,661,466 (19.4.43; 1.12.53). W. M. Barret, assr to Engineering Research Corpn. Transmitting and receiving apparatus and method for electromagnetic prospecting.

U.S.P. 2,663,002 (20.6.50; 15.12.53). L. B. McManis and J. R. Cooper, assrs to Stanolind Oil and Gas Co. Attenuator for seismic gain control.

U.S.P. 2,664,542 (27.7.52; 29.12.53). R. D. Lynn, assr to Standard Oil Development Co. Magnetic well logging apparatus. D. A. R.

DRILLING

1180. Determination of graphite in drilling mud. F. O. Jones and J. L. Lemmus. *J. Petrol. Tech.*, Aug 1953, **5** (8), 17.—Recently graphite has been substituted for oil in drilling mud in some circumstances to avoid core contamination. Determination of the graphite concn has presented problems. In a successful method the diluted mud is shaken with toluene. Sufficient graphite enters the toluene to permit the estimation of the mud's graphite content by visual comparison with suitably prepared samples. Details of the procedure are given.

Quebracho, phosphates, and barytes do not interfere with the test, but lignosulphates, by wetting the graphite, do interfere. G. D. H.

1181. Measuring and interpreting high-temperature shear strengths of drilling muds. T. E. Watkins and M. D. Nelson. *J. Petrol. Tech.*, Aug. 1953, **5** (8), AIMME Tech. Paper No. 3638, 213–18.—Lime-base muds have certain advantages, but it has been found that when subjected to temp exceeding 250° F a strongly gelled condition may set in rapidly. Symptoms indicative of this state in wells are listed. The gelation may be due primarily to the reaction of lime, quartz, and clay to form calcium silicates and alumino-silicates which may set in some respects like cements. In the laboratory, muds have been heated at temp up to 350° F in a bomb which could be sealed so that heating took place under pressure. The shear strength was measured by a cyl tube shearometer, and a nomograph is given for computing shear strengths from laboratory test data. A further nomograph permits an estimate to be made as to whether completion or testing tools can be run in the well when gelling is the sole impeding factor. The procedure and testing may permit the best mud treatment to be determined. G. D. H.

1182. Coring in rotary drilling. K. Wojnar. *Nafta (Krakow)*, 1953, **9**, 113–17.—According to the purpose of coring, different types of coring bits are evolved. Described are Tylczewski corer for soft rocks, single and double pipe corers by Volodchenko, " V.S.E.G.E.I." type corers for loose conglomerates, and several instruments for breaking off the core from its seat. The effective time of working at the bottom of the well is

$$t_{max} = \frac{Q}{2\omega f K_s^2 \tan \beta n z F}$$

where

Q = total axial force, kg;
ω = bit abrasion coeff, c.c. per (kg × cm);
$f = \frac{2Mb}{zQ_0(R^2 - r^2)}$

(where b = length of each tooth in bit, M = moment of friction, and Q_0 = axial force per tooth);

K_s = rock abrasion coeff;
$F = (R^2 - r^2)\pi$ = cross-sectional area of the bit, cm²;
z = no. of teeth;
β = cutting angle of teeth;
n = no. of revs per minute. M. S.

1183. Minimum–maximum thermometer (for well temperature measurement). J. Czyzowski. *Nafta (Krakow)*, 1953, **9**, 119–21.—Instrument developed by Polish I.P. is a " mercury-in-glass " type with floats which indicate minimum and maximum temp in the well. It is protected against mechanical injury. M. S.

1184. Universal unit for drilling and production " J L5—Rudno." S. Karlic. *Nafta (Krakow)*, 1953, **9**, 145–50.—This can be used for rotary drilling to 1200 m, percussion drilling to 1500 m, for lowering pumping units to 2000 m, and casing to 1500 m. M. S.

1185. Two decades of electrical logging. H. G. Doll. *J. Petrol. Tech.*, Sept. 1953, **5** (8), 33–41.—The first oil well resistivity log was made in 1927, and the first S.P. log in 1931. Until 1937 electrical logging was mainly limited to correlation and determining bed thickness. In 1938 the first paper on quantitative interpretation appeared. Long spacing gave resistivities for thick beds which were not too deeply invaded.

With marked invasion no curve gave true resistivity, but multiple spacings combined with departure curves improved the position. At the end of the war oil and water saturation could be determined only in clean, unconsolidated sands; correlation was quite good in all types of formations. The micro log, introduced in 1948, gave the resistivity of the invaded zone and detected permeable beds. The focused logs give deep investigation, and give good resistivities even when the beds are not very thick. Some can be used in salt muds, and the induction log can be made in oil-base mud.

Gamma ray logs were introduced *ca* 1940, and neutron logs in 1942.

Different combinations of the various logs are capable of giving satisfactory results in different types of formations, except shaly sands. G. D. H.

1186. Patents. U.S.P. 2,660,887 (1.9.50; 1.12.53). F. Frei. Method for detecting the source and analysing the flow of water intrusions in oil wells.

U.S.P. 2,661,063 (21.7.51; 1.12.53). C. R. Owens. Method and means of pulling pipe from a well.

U.S.P. 2,661,064 (1.11.46; 1.12.53). J. Rockoff, assr to Dayton Rubber Co. An oil well packer having a packer sleeve comprising an annular inner rubberized textile layer and an annular metal reinforcing ring member on each of the ends of the packer sleeve positioned over the ends of the inner textile layer.

U.S.P. 2,661,065 (24.5.48; 1.12.53). C. J. McCoy. A device for cleaning perforate well casings.

U.S.P. 2,661,334 (11.2.52; 1.12.53). J. L. Lummas, assr to Stanolind Oil and Gas Co. A stable water-in-oil emulsion drilling fluid containing at least 2·5 lb/brl of an oil-soluble, non-ionic, surface-active ester of a polyhydric alcohol with an acid having at least 12 carbon atoms to the mol and also at least 0·1 lb/brl of a water-soluble, non-ionic, surface-active agent.

U.S.P. 2,661,600 (31.12.47; 8.12.53). G. R. Hopkins. Underwater drilling derrick.

U.S.P. 2,661,697 (26.12.51; 8.12.53). M. V. Long and F. C. Schneider, assrs to Shell Development Co. Control system for oil well pumps.

U.S.P. 2,661,803 (25.9.53; 8.12.53). G. H. Ramsey, assr to Standard Oil Development Co. Apparatus for collecting a sample of fluid from the lower end of a drill pipe.

U.S.P. 2,661,928 (9.2.52; 8.12.53). E. Topanelian, assr to Gulf Research and Development Co. A fluid-operated well-drilling mechanism.

U.S.P. 2,661,930 (17.5.50; 8.12.53). F. J. Spang, assr to Spang and Co. A unitary combined socket, jar, and percussion drilling tool for the reciprocal drilling of a well bore.

U.S.P. 2,661,931 (4.12.50; 8.12.53). K. H. Swart, assr to Security Engineering Division. Hydraulic rotary rock bit.

U.S.P. 2,661,932 (16.12.50; 8.12.53). H. B. Woods, assr to Hughes Tool Co. Roller cutter bit with fluid flushed bearings.

U.S.P. 2,662,474 (25.7.49; 15.12.53). G. F. Turecheck and W. H. Lindsay, assrs to Lane-Wells Co. Well casing perforator.

U.S.P. 2,662,505 (16.6.51; 15.12.53). W. H. Cline, assr to Hughes Tool Co. Hydraulic impact tool.

U.S.P. 2,662,599 (12.1.48; 15.12.53). R. C. Baker, assr to Baker Oil Tools Inc. An imperforate well cementing plug having a packing adapted to slidably seal with the wall of a well casing; and a valve head rigidly secured to and depending substantially below the lower end of the plug and having a generally hemispherical downwardly facing surface adapted to seal against a companion seat in the casing.

U.S.P. 2,662,600 (12.1.48; 15.12.53). R. C. Baker and J. R. Baker, assrs to Baker Oil Tools Inc. A top cementing plug, including a forward rigid valve head portion and an elastic rearward portion secured to the head portion and having an inwardly compressible main body.

U.S.P. 2,662,601 (9.3.50; 15.12.53). E. W. Bagnell, assr to Johnston Testers Inc. An internal anchor device for wells, comprising a body structure, at least one swingably mounted dog on the body structure spring-urged outwardly toward the walls of the well bore, a sleeve rotatably carried by the body structure and surrounding the dog and being formed with a slot circumferentially spaced from the dog and adapted to be brought into registry with the dog to release the same for outward movement, and means on the sleeve frictionally engageable with the walls of the well bore to retard rotary movement of the sleeve upon rotation of the body structure to cause the slot to be brought into registry with the dog to release it.

U.S.P. 2,662,602 (27.6.47; 15.12.53). S. B. Schnitter, assr to L. L. Rector. Means for guiding, floating, and cementing well casing in bored holes.

U.S.P. 2,662,735 (18.11.48; 15.12.53). A. Arutunoff. An anti-rotation device for a deep well drill.

U.S.P. 2,662,737 (31.1.47; 15.12.53). V. Edelberg. Automatic control of slips of drill pipe strings of sounding holes.

U.S.P. 2,662,738 (23.3.50; 15.12.53). F. F. Davis and S. G. Richmond, assrs to E. J. Longyear Co. A bit for core drilling.

U.S.P. 2,662,797 (29.9.47; 15.12.53). J. Moon, assr to Western Oil Tool and Engineering Co. A tubing platform for demountable drilling masts.

U.S.P. 2,662,827 (12.3.46; 15.12.53). J. B. Clark, assr to Stanolind Oil and Gas Co. A hydraulic cement slurry having a retarded tendency to dehydrate physically and adapted for cementing an oil well, the slurry consisting of Portland cement, water, and a cement water-loss-reducing additive including prehydrated starch in an amount of at least 1·5% of the weight of the cement and in an amount that substantially inhibits the tendency of the slurry to lose water when the slurry contacts the permeable formations penetrated by the well under elevated pressures.

U.S.P. 2,663,326 (22.1.53; 22.12.53). A. C. Curtis, assr to Pipelife Inc. End closure for pup joints used in coating the interior of pipelines.

U.S.P. 2,663,370 (31.5.52; 22.12.53). R. Donnell and J. Ray. Fishing tool for wells.

U.S.P. 2,663,379 (10.5.48; 22.12.53). R. L. Doan, assr to Phillips Petroleum Co. Drilling mud gaseous extraction apparatus.

U.S.P. 2,664,049 (16.2.48; 29.12.53). C. J. Coberly, assr to Dresser Equipment Co. Fluid-operated pump with pneumatic shock absorber.

U.S.P. 2,664,156 (11.9.50; 29.12.53). T. O. Allen, assr to Standard Oil Development Co. Small gun perforator for wells.

U.S.P. 2,664,157 (11.9.50; 29.12.53). G. F. Abendroth, assr to Standard Oil Development Co. Small gun perforator for oil wells.

U.S.P. 2,664,158 (11.9.50; 29.12.53). J. G. McKean, assr to Standard Oil Development Co. Gun for perforating casing.

U.S.P. 2,664,162 (24.6.48; 29.12.53). K. C. Howard, H. E. McGowen, Jr, and H. H. Moore, assrs to Sid W. Richardson Inc. Means for installing and removing flow valves on a well bore.

U.S.P. 2,664,163 (16.4.49; 29.12.53). S. B. Schnitter, assr to L. L. Rector. Well cementing apparatus.

U.S.P. 2,664,164 (11.8.51; 29.12.53). J. Gannon, assr to B. Weingart. Well packer.

U.S.P. 2,664,454 (18.11.49; 29.12.53). A. Arutunoff. Swivel electrical connexion for deep well drills.

U.S.P. 2,664,178 (13.5.49; 29.12.53). L. A. Whipple, assr to Rocky Mountain Drilling Co. Drilling rig base.

U.S.P. 2,664,270 (19.4.51; 29.12.53). J. A. Zublin. Apparatus for controlling the course of a lateral bore deviating from a vertical well bore.

U.S.P. 2,664,272 (5.7.46; 29.12.53). E. G. Boice, assr to Reed Roller Bit Co. A drill stem coupling.

U.S.P. 2,664,321 (14.9.50; 29.12.53). W. B. Noble, assr to Reed Roller Bit Co. Roller bit.

U.S.P. 2,664,322 (9.10.50; 29.12.53). E. G. Boice, assr to Reed Roller Bit Co. Roller bit. D. A. R.

PRODUCTION

1187. Volumetric efficiency of sucker rod pumps when pumping gas–oil mixtures. C. A. Connally, C. R. Sandberg, and N. Stein. *J. Petrol. Tech.*, Oct. 1953, **5** (10), AIMME Tech. Paper No. 3670, 265–70.—Tests have been made on an experimental set-up to find the volumetric efficiency of oil well pumps handling gas–oil mixtures. The equipment and tests are described in detail. The variables studied were G.O.R., pump compression ratio, stroke length, pump speed, and clearance between the valves at their nearest approach, 2 different pumps and 2 different oils being used. Relatively small volumes of gas entering the pump resulted in large decreases in volumetric efficiency, because pump volumetric efficiency is based on liq pumped, and because gas is compressible. When the pump was operating under reduced efficiency because of the presence of gas, it was found that variation in the clearance volume had a marked effect on pump efficiency. Pump efficiency was little affected by pump speed in the tests, but in the field poor valve action may cause a drop in efficiency at higher pump speeds. Other variables had little effect under the range of conditions studied.

G. D. H.

1188. Patents. U.S.P. 2,661,066 (26.6.48; 1.12.53). D. C. Bond, assr to Pure Oil Co. A method of increasing the permeability of a consolidated oil-bearing geological stratum to facilitate the flow of oil therethrough, which comprises forcing into the oil-bearing stratum a fluid substance convertible to a solid of increased volume, withdrawing sufficient heat from the fluid substance to cause solidification of the fluid substance within the stratum whereby the stratum is fractured, thereafter applying heat to the stratum to fluidize the solidified substance and subsequently flushing the fluidized substance from the stratum, thereby accomplishing an increase in the permeability of that stratum.

U.S.P. 2,663,265 (3.10.46; 22.12.53). H. U. Garrett and C. M. Peters, assrs to Garrett Oil Tools Inc. Well flowing device.

U.S.P. 2,663,307 (16.7.49; 22.12.53). L. J. Birdwell, assr to American Iron and Machine Works Co. A washout device for installation in a tubing string at a point directly above a well packer.

U.S.P. 2,664,165 (17.8.51; 29.12.53). D. C. Bond, assr to Pure Oil Co. Increasing productivity of siliceous geological formations.

U.S.P. 2,664,398 (2.12.52; 29.12.53). D. C. Bond, assr to Pure Oil Co. In the recovery of fluids from subterranean reservoirs, the method of reducing the resistance to the flow of the fluids through siliceous deposits encountered in the development and exploitation of fluid producing reservoirs which comprises contacting the deposits with an aq soln of a fluophosphoric acid, the soln having a sufficient concn of fluophosphoric acid and being present in an amount sufficient to reduce the fluid flow resistance of the formations.

D. A. R.

OILFIELD DEVELOPMENT

1189. Truncation-type traps offer a new horizon. J. Ryan. *World Oil*, Oct. 1953, **137** (5), 177.—The Central Basin Platform of W. Texas offers a wide range of petroleum traps. As well as the important anticlines, reefs, and porosity lenses there are other minor traps, including the truncation type.

Structural upheaval in Pennsylvanian times formed anticlinal ranges, domes, and fault scarps. The erosional period following caused much of the exposed rock to be removed, leaving a truncated surface for deposition. Sharply tilted beds were bevelled, and in places anticlinal crests were reduced such that the granite basement was exposed, with the younger sediments around.

The Block 11 Devonian field is an example of such a truncated trap. The reservoir rock—Basal Devonian chert and limestone—averages 70 ft in thickness at 4917 ft. Oil is 41° API, production being by solution gas drive.

Numerous sections and diagrams are included. W. S. R.

1190. Velma oilfield, Stephens County, Oklahoma. R. B. Rutledge. *Petrol. Engr*, Dec. 1953, **25** (13), B38.—Prolific oil production is obtained from rocks of Permian, Pennsylvanian, Mississippian, and Ordovician age. The complexly folded and faulted Velma structure is near the southern limit of the Anadarko Basin, where 7000 ft of marine Pennsylvanian strata were deposited. Structural history of the area is complex, there being 2 periods of great activity: (1) post Morrow and (2) post Hoxbar. Newly formed structures were deeply truncated by erosion. After the late Hoxbar deformation and subsequent erosion the very complicated Velma structure was covered by 1000 ft of Permian sediments—sandstones and shales. Arching has produced a mappable surface structure.

Reservoir operation is believed to be due to a combination of solution gas drive and gravity drainage. Low G.O.R.s indicate that gravity drainage will be increasingly effective, despite the relatively high oil viscosity.

Operation and control of the field are described, numerous tables and diagrams being included. W. S. R.

1191. Developments in Coal County, Oklahoma. K. A. Gravelle. *Petrol. Engr*, Dec. 1953, **25** (13), B109.—Coal County lies at the western tip of the McAlester–Arkansas Coal Basin. Until 1950 little return had been obtained for wildcat drilling. Since the discovery of high gravity oil in the Oil Creek member of the Simpson at 7500 ft in the No. 1 Styron well much exploration has been carried out. To date some 9 wells have all found oil or gas in various formations—Oil Creek, Bromide, and Cromwell.

Certain discouraging factors in future work are: (1) poor Pennsylvanian sand development; (2) extreme complexity of faulted structures in the western portion; and (3) great depths to Ordovician horizons on the eastern anticlines and near the Choctaw fault.

Except for the gas on the Ashland anticline, all known accumulations of oil and gas in the county are in the complex western section. This is probably due to more extensive exploration because of shallower drilling depths. W. S. R.

1192. West Ardmore Basin discovery. S. H. Crews. *Petrol. Engr*, Dec. 1953, **25** (13), B113.—The West Royal Pool now contains 3 producers. The discovery well produced from Conglomerate (Pennsylvanian). Subsequent wells have proved that the Simpson (Ordovician) is also productive. Completion in the No. 1 Chism well was made in the interval 7035–7677 ft. Well flowed 130 b.d. G.O.R. was 88 cu. ft/brl.

Article includes electrical well logs of the field. W. S. R.

1193. Ohio establishes world's new depth record. W. T. Rintoul. *Petrol. Engr*, Oct. 1953, **25** (11), B55.—The well, situated in the Paloma field, was planned as a test for production from the Oceanic sand (Oligocene) and the Point of Rocks sand (Eocene). Both these zones are prolific producers in fields some 27 miles NW. Drilling has reached 20,521 ft and is continuing.

Hard, compact shales and sandstones necessitated the use of diamond bits and diamond core heads. From 10,947 ft downwards these special bits have drilled practically the entire remaining hole.

135 cores, totalling 5143 ft, have been cut—of these only 11 were cut prior to 13,877 ft, where nearly continuous coring was commenced.

A water clay base mud was used down to 10,955 ft, but due to high earth temp an oil based mud was used below this depth. Temp at 20,003 ft was 334° F.

Cost of the operation is about $1,300,000. W. S. R.

1194. Iraq Zubair oilfield development. V. S. Swaminathan. *Petrol. Engr*, Nov. 1953, **25** (12), A62.—Since the concession was granted in 1938 much exploration and survey has been carried out. The first well flowed in May 1949. A total of 30 producers has been drilled (866-acre spacing) to an average completion depth of 11,000 ft.

The field has 4 pay zones, of which 2 are of major importance. Of these, the 3rd pay produces 35° API oil at 11,000 ft and the 4th pay 43° API oil at 11,000 ft. Both are Lower Cretaceous sandstones.

The 2nd pay consists of a Middle Cretaceous limestone and produces 26° API oil 3·8% sulphur at 7000 ft; the 1st pay produces a heavy asphaltic crude of 20° API oil 4·5% sulphur from Lower Fars limestone and sandstone at 1000 ft.

The article describes the construction of the 65-mile (24-inch) pipeline from Zubair to Fao. W. S. R.

TRANSPORT AND STORAGE

1195. Tanker construction in 1953. Anon. *Mot. Ship*, Jan. 1954, **34** (406), 427.—It is estimated that a total of 188 tankers were completed throughout the world in 1953, an aggregation of some 3,315,000 tons d.w.c.; 48 were of 20,000 dw tons and above, a total of 1,253,150 tons. More than half the number of ships are for American interests, and many are under Liberian and Panamanian flags. The individual ships of 20,000 tons d.w.c. and above are listed, with details of owners, builders, type of machinery, and b.h.p., while another table shows the same ships listed according to country of operation and detailing the country of construction. U. M.

1196. Present and future world tanker fleet outlook. J. I. Jacobs. *Petrol. Times*, 16.4.54, **58** (1479), 396.—A review of tanker tonnage is given, together with the position as to completions, and of new business in the shipyards. Analyses of world tanker fleet of 2,000 dw tons and over by country and by age are tabulated. G. A. C.

1197. Vertical cargo oil pump of new design. Anon. *Mot. Ship*, Jan. 1954, **34** (406), 443.—A new pump, manufactured by A/S Eureka Mek. Verk., Oslo, is described. It is a duplex steam-driven unit, manufactured in 3 models with outputs of 400, 510, and 750 tons of water/hr. Detail section plans are given of the 510-ton model. It is claimed that steam consumption of this class of pump should be at least 30% less than that of conventional horizontal cargo oil pumps.

U. M.

1198. Gas storage in the Playa del Rey oilfield. J. Riegle. *J. Petrol. Tech.*, Oct. 1953, **5** (10), AIMME Tech. Paper No. 3669, 259–64.—Playa del Rey, California, is probably the first successful attempt at storing gas in a partially depleted oil reservoir, with the recovery of large volumes of gas at high rates as the main objective. The reservoir employed is a continental conglomerate in depressions on a weathered schist high. An area of *ca* 240 acres is used, but it has been found that under certain pressure differentials some gas migrates into an adjacent 70-acre area.

The operational procedure, history, and reservoir performance are summarized for 10 years from the inception of the project in 1942. The problems encountered include the removal and retardation of the formation of water-in-oil emulsion, the movement up structure of fluid during withdrawal periods, forming fluid blocks, and reservoir shrinkage due to edgewater advance. These problems have in part been solved, and the withdrawal rate has risen from the designed capacity of 4000 m.c.f/hr to 10,000 m.c.f/hr.

G. D. H.

1199. Increased efficiency at pump stations. R. G. Deering. *Oil Gas J.*, 12.4.54, **52** (49), 118.—A pneumatic control system, recently installed by Texas Empire pipeline at its Paloka, Ill., crude oil pump station, accurately adjusts diesel-engine speed to meet pipeline load requirements. Pipeline load factor and station operating efficiency have been increased. Facilities are provided to shut down engines automatically in case of emergency. G. A. C.

1200. Ain Zalah–K2 pipeline. Anon. *Fluid Handl.*, 1954, **49**, 30–4.—The laying of the pipeline and the mode of protection used is described. Details of installations at Ain Zalah and K2 pumping station are also included. D. M.

1201. Patents. U.S.P. 2,661,026 (9.11.48; 1.12.53). E. Schulthess. Oil hose.

U.S.P. 2,661,241 (19.1.51; 1.12.53). J. B. Veneziano. Device for washing oil tanks with water.

U.S.P. 2,661,761 (31.1.50; 8.12.53). D. Samiran. Multiple fuel tank servicing system for aircraft.

U.S.P. 2,662,552 (6.10.52; 15.12.53). E. A. Rowe and R. M. Zschau. River weight for pipelines.

U.S.P. 2,662,859 (15.6.49; 15.12.53). W. H. Kirkpatrick, assr to Visco Products Co. A process of breaking water-in-oil emulsions which comprises treating such emulsions with a diether of a polyoxyalkylene aliphatic diol.

U.S.P. 2,664,220 (23.10.50; 29.12.53). H. O. Cord, B. G. Merten, and F. E. Klapheke, assrs to Standard Oil Co. An apparatus for storing volatile liq comprising a cyl shell, a roof member vertically movable in the shell, a contact shoe seal between the shell and roof, a peripheral recess in the roof member, and an inflated deformable annular cell means having its inner peripheral portion within the recess to provide a flexible and extendable support for the contact shoe between the roof and shell.

U.S.P. 2,664,262 (24.8.51; 29.12.53). F. H. Mueller and J. J. Smith, assrs to Mueller Co. Stopper for large pipelines. D. A. R.

Ger.P. 907,290, 11.2.54. — Schmidt, München. Procedure for storing H_2.
BrennstChemie, 1954, **35** (5–6). R. T.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1202. Opening of the £A10 million Shell Geelong refinery. Anon. *Petrol. Times*, 16.4.54, **58** (1479), 364.—A brief description is given of Shell's new 650,000 tons/year refinery at Geelong, Victoria, the first of Australia's new chain of major refineries to come into operation since the war. The crude oil for Geelong will be obtained from the Middle East and the Seria oilfield of British Borneo. G. A. C.

1203. Finned tubes in heat exchangers. R. B. Williams and D. L. Katz. *Petrol. Refin.*, 1954, **33** (3), 145–9.—Experimental comparison of plain tube and finned tube heat exchangers shows the latter to be more economical when the shell side heat transfer coeff is low, as with viscous oils. Heat transfer and pressure drop data for finned tubes are given, and a rough relationship for predicting the oil visc at which finned tubes become more economical in shell and tube units is plotted. R. D. S.

1204. Shortcut to heat exchanger design—V. C. H. Gilmour. *Chem. Engng*, 1954, **61** (2), 190–4.—This fifth article in the series describes design methods for conditions of vapour deposition and condensate sub-cooling, condensate of immiscible liq, and cross flow in shell. D. M.

1205. Efficient disposal of waste water. D. H. Stormont. *Oil Gas. J.*, 29.3.54, **52** (47), 86.—The redesigned waste water disposal system of General Petroleum, Torrance, California, refinery is described. The treating facilities were considerably overloaded due to continued plant expansions and use of more complex processes. The new plant will permit reuse of about $\frac{3}{4}$ of the volume of water now being discharged into the Los Angeles County waste water disposal system. The new system utilizes an underground skimming pit on which a vacuum is maintained by means of conventional vapour recovery equipment. Chemical treatment of the raw water and filtration of the resulting sludge in a precoat rotary filter is almost entirely automatic. A detailed diagram of the waste water disposal unit is given. G. A. C.

1206. A shortcut method for designing fired tubular reactors. P. G. Murdoch and C. D. Holland. *Petrol. Refin.*, 1954, **33** (3), 159–63.—A short approx calculation procedure is developed for application to endothermic, first order, gas phase reactions in reactors consisting essentially of straight tubes connected by return bends, most but not all of the straight portion of each tube being heated on the outside by flue gas. A worked example of the application of the method is given. R. D. S.

1207. Evaluate your depreciation charges. A. M. Hartogensis and H. D. Allen. *Chem. Engng*, 1954, **61** (2), 195–8.—A basic background on depreciation, deterioration, and obsolescence, showing how it can be applied to specific situations in particular plants. D. M.

1208. Next time use capitalized costs. F. C. Jelen. *Chem. Engng*, 1954, **61** (2), 199–203.—A basis for comparing costs of alternatives on a common denominator basis. It accounts for differences in first cost, operating expense, deferred costs, obsolescence, and salvage value. D. M.

1209. Solve for flat head thickness graphically. J. A. Hunter. *Petrol. Refin.*, 1954, **33** (3), 181–2.—A chart is presented for the graphical solution of both ASME and TEMA equations for the thickness of tubesheets, blind flanges, flat end closures, etc. R. D. S.

1210. Monolithic linings for refinery service. W. A. Bradbury. *Petrol. Refin.*, 1954, **33** (3), 167–72.—Presents data and information based on experimental work and field installations of monolithic linings in vessels and lines handling cat and hydrocarbons at high temp and varying densities and velocities. The advantages of these linings are low initial and maintenance costs, ease of installation and repair, resistance to abrasion and thermal or mechanical shock, and adequate insulation. Penetration of the linings by hydrocarbon vapours appears to have no deleterious effects on the thermal or mechanical properties. R. D. S.

1211. Patents. U.S.P. 2,661,798 (12.11.48; 8.12.53). O. L. Clevenger, A. McElhannon, and W. W. Jones, assrs to Standard Oil Development Co. Flare stack, pilot burner, and pilot ignitor.

U.S.P. 2,662,041 (30.12.49; 8.12.53). P. F. Dougherty and L. G. Magill, assrs to Sun Oil Co. Process for cleaning refining equipment. D. A. R.

Ger.P. 905,095, 14.1.54. — Betzler, assr to Allgemeine Feuerlöscher AG, in liquidation, Frankfurt (M.). Device for introducing quenching media, *e.g.* foam, into combustible liq storage containers.

Ger.P. 905,972, 28.1.54. — Kaufmann and — Kolbe, assrs to Farbwerke Hoechst AG, formerly Meister, Lucius & Brüning, Frankfurt (M.). Heat exchanger. (Addn. to Pat. 899,795).

Ger.P. 905,973, 28.1.54. — Raichle, assr to BASF, Ludwigshafen (Rhein). Reaction vessel.

Ger.P. 906,812, 4.2.54. — Pütz, assr to Beckers Vennwegen (Kr. Aachen). Plant for compressing or pumping gases and liq.

Ger.P. 883,598, 11.2.54. — Arnold, — Heilmann, and — Vollmer, assrs to Metallges. AG, Frankfurt (M.). Process and plant for agitating adsorbents or cat.

Ger.P. 906,814, 4.2.54. — Fiedler, Berlin. Stationary gas liquefaction and separating apparatus.
BrennstChemie, 1954, **35** (5–6). R. T.

DISTILLATION

1212. Underloading causes poor operation. A. L. Gagneux and A. B. Hiser. *Petrol. Refin.*, 1954, **33** (3), 165–6.—Underloading in dist equipment may be traced to low charge rates or inadequate heat input, and results in insufficient stripping or unstable tray operation. 2 illustrations of unsatisfactory operation are given and the remedies adopted described. R. D. S.

1213. Simplified apparatus for low temperature distillation. S. P. Preston and W. J. Podbielniak. *Petrol. Refin.*, 1954, **33** (4), 132–4.—A description of a simple and inexpensive, partially automatic apparatus for low temp fractional dist. The accuracy obtainable is limited primarily by the skill of the operator. R. D. S.

ABSORPTION AND ADSORPTION

1214. Patents. U.S.P. 2,662,049 (29.12.51; 8.12.53). S. F. Magor and R. A. Daugherty, assrs to Superior Oil Co. A process for absorption-recovery of desired hydrocarbon fractions from gases.

U.S.P. 2,664,202 (22.12.49; 29.12.53). J. D. Bartleson, assr to Standard Oil Co. Improving the colour of lubricants and lub additives which are reaction products of 5–60% by wt of a phosphorus sulphide and 95–40% of a mixture of one part by wt of an oxygen-containing organic compound with 1 to 10 parts of a polyolefin by treating such reaction products with an amount of adsorbent decolorizing agent in the range of 1–10% by wt of the reaction mixture and sufficient to improve the colour of the reaction product, the decolorizing agent having a water content in the range of 0–6% by wt, and recovering improved reaction product. D. A. R.

Ger.P. 906,331, 28.1.54. BASF, Ludwigshafen (Rhein). Process for separating sulphur-free org compounds.

Ger.P. 906,571, 4.2.54. — Herbert and — Eisenlohr, assrs to Metallges. AG, Frankfurt (M.). Process for recovering hydrocarbons and aliphatic alcohols and/or other aliphatic compounds containing O_2, *e.g.* ketones, aldehydes, esters, ethers from their mixtures.

Ger.P. 906,600, 4.2.54. — Nonnenmacher, — Oettinger, and — von Füner, assrs to BASF, Ludwigshafen (Rhein). Procedure for reactions producing carbonaceous separations in presence of activated C.

BrennstChemie, 1954, **35** (5–6). R. T.

SOLVENT EXTRACTION AND DEWAXING

1215. Patent. U.S.P. 2,661,317 (17.3.49; 1.12.53). W. E. Skelton, H. V. Hess, G. B. Arnold, and B. L. Mahan, assrs to Texas Co. A continuous method of separating wax from wax-bearing mineral oil by contacting the oil with urea in solid particle form at a temp in the range of *ca* 75°–125° F in the presence of a small amount of a polar solvent liq.

D. A. R.

CRACKING

1216. Compare these 17 feeds for cat crackers. E. C. Oden and J. L. Perry. *Petrol. Refin.*, 1954, **33** (3), 191–3.—Feed stocks which were previously borderline cases have assumed greater importance with the expansion of cat cracking capacity. Analyses of the yields from several of these borderline stocks, including virgin gas oils, vacuum dist, and cat cracker cycle oils, are discussed here. R. D. S.

1217. New data on Unifining. H. W. Grote, C. H. Watkins, H. F. Poll, and G. W. Hendricks. *Petrol. Refin.*, 1954, **33** (4), 165–70; *Oil Gas J.*, 19.4.54, **52** (50), 211.—Unifining consists of hydrogenation of various stocks over cat containing cobalt and molybdenum, resulting in almost complete removal of sulphur, nitrogen, and metals, and an increase in stability when applied to cracked dist. Stocks used include cracked or straight run gasolines, virgin or cracked middle dist, and higher boiling fractions such as heavy coker dist. The application of the process to such stocks is discussed with special reference to the products and yields. R. D. S.

1218. Ultraforming—new reforming process. J. H. Forrester, A. L. Conn, and J. B. Malloy. *Petrol. Refin.*, 1954, **33** (4), 153–6; *Oil Gas J.*, 12.4.54, **52** (39), 139.—By reforming naphthas at lower pressures than normal increased yields of gasoline are obtained, especially at high octane levels. The reactors in this process operate at 900° F and 200–300 p.s.i.g., and the cat used contains 0·6% platinum on an alumina support, favouring the conversion of paraffins as well as naphthenes to aromatics. Cat regeneration is needed after about 5·6 brl/lb cat at 300 p.s.i., and slightly improves the initial activity before reaching a constant level. Cat life is estimated to be well above 150 brl/lb under these conditions.

R. D. S.

1219. New pebble heater process. M. O. Kilpatrick, L. E. Dean, D. S. Hall, and K. W. Seed. *Petrol. Refin.*, 1954, **33** (4), 171–4.—This process, developed by Phillips Petroleum Co, for light hydrocarbon cracking and high temp superheating obtains higher yields of ethylene and acetylene by using higher temp, shorter contact times, and lower pressures than those normally used in tube cracking furnaces. ⅜-inch refractory spheres are used as the heat transfer medium, and yields of ethylene 50% greater than from tube furnaces are claimed when cracking *n*-butane. The process is described and the yields discussed in this article. R. D. S.

1220. Patents. U.S.P. 2,661,321 (10.11.52; 1.12.53). A. H. Schutte, assr to Lummus Co. Hydrocarbon conversion process and regeneration of fouled contact material utilizing flue gas and steam as the gas lift.

U.S.P. 2,661,324 (25.2.50; 1.12.53). F. W. Leffer, assr to Universal Oil Products Co. Conversion of heavy hydrocarbonaceous materials in the presence of subdivided coke.

U.S.P. 2,662,003 (8.4.46; 8.12.53). P. M. Waddill and F. C. Fowler, assrs to Phillips Petroleum Co. Process for effective cat conversion of hydrocarbons.

U.S.P. 2,662,005 (12.1.53; 8.12.53). L. P. Evans, assr to Socony-Vacuum Oil Co. Gaseous fuel production.

U.S.P. 2,662,050 (16.3.49; 8.12.53). J. W. Moorman and L. J. Kelly, assrs to M. W. Kellogg Co. A process for the cat cracking of heavy residual oils containing a substantial portion of constituents unvaporizable without decomposition to form lower boiling hydrocarbons in the motor fuel boiling range.

U.S.P. 2,662,051 (28.12.49; 8.12.53). H. L. Pelzer, assr to Sinclair Refining Co. A process for treating heavy hydrocarbon oils which comprises preheating the charge oil to an incipient cracking temp of *ca* 850°–950° F for *ca* 2–15 minutes and limiting the % crack to below *ca* 10% based on 400° F end point gasoline and lighter materials, flashing the preheated charge in a tower maintained at a pressure of atmospheric to about 10 p.s.i.g., reducing the temp within the flash zone to *ca* 790°–850° F by introduction into the tower of *ca* 10–25 wt % of steam having a temp from *ca* 212° to 300° F and removing vaporized materials and bottoms from the flash tower.

U.S.P. 2,662,816 (20.7.48; 15.12.53). J. C. Kalbach, assr to Hydrocarbon Research Inc. Gasification of carbonaceous materials containing volatile constituents.

U.S.P. 2,662,844 (19.1.50; 15.12.53). F. W. Leffer, assr to Universal Oil Products Co. Conversion or cracking of light and heavy oil fractions in the presence of subdivided contact material.

U.S.P. 2,663,625 (22.11.48; 22.12.53). P. L. Born, assr to Gas Machinery Co. Oil gas process and apparatus.

U.S.P. 2,663,675 (23.11.50; 22.12.53). R. B. Ewell, assr to Shell Development Co. Conversion of hydrocarbon oils.

U.S.P. 2,663,677 (28.2.50; 22.12.53). R. T. Savage and E. H. Ivey, assrs to Houdry Process Corpn. Processing hydrocarbons.

U.S.P. 2,663,678 (10.7.50; 22.12.53). M. O. Kilpatrick, assr to Phillips Petroleum Co. Decoking of pebbles in pebble heater cracking of hydrocarbons.

U.S.P. 2,664,386 (12.5.49; 29.12.53). V. Haensel, assr to Universal Oil Products Co. 2-stage process for the cat reforming of gasoline. D. A. R.

Ger.P. 905,848, 21.1.54. — Free, — von Füner, and — Göhre, assrs to BASF, Ludwigshafen (Rhein). Method for producing active cat containing Si or cat supporter.

Ger.P. 906,486, 28.1.54. — Free and — von Füner, assrs to BASF, Ludwigshafen (Rhein). Process for cat conversion of substances containing C at high temp.

Ger.P. 906,599, 4.54. — Pier, — Free, and — von Füner, assrs to BASF, Ludwigshafen (Rhein). Process for cat cracking of hydrocarbon oils.

Ger.P. 908,018, 25.2.54. — Ohme, assr to Dortmunder Paraffinwerke G.m.b.H., Dortmund. Process for cat conversion of acetone.

Ger.P. 907,770, 18.2.54. — Grabbe and — Rosenthal, assrs to Sunlight Ges AG, Hamburg. Method for producing cat.
BrennstChemie, 1954, **35** (5–6). R. T.

HYDROGENATION

1221. Patents. U.S.P. 2,661,320 (14.7.51; 1.12.53). La V. H. Beckberger and R. C. Woerner, assrs to Sinclair Refining Co. In a process for reforming a petroleum hydrocarbon fraction boiling in the naphtha range in the presence of a molybdenum oxide reforming cat on alumina base containing a stabilizing proportion of silica and in the presence of a hydrogen-containing gas stream under conditions of *ca* 850°–1000° F, *ca* 500–1000 p.s.i.g., 0·5–4·0 liq hourly space velocity, and a hydrogen to hydrocarbon ratio of *ca* 2 : 1 to 8 : 1, the step of adding *ca* 0·001–0·2% oxygen to the hydrogen containing gas stream.

U.S.P. 2,662,846 (30.12.50; 15.12.53). C. W. Montgomery and W. A. Horne, assrs to Gulf Research and Development Co. A process for destructively hydrogenating a high boiling hydrocarbon charge which contains residual components.

U.S.P. 2,664,404 (18.8.49; 29.12.53). L. J. Blatz and R. C. Brandon, assrs to Standard Oil Development Co. Regeneration of selective hydrogenation cat. D. A. R.

Ger.P. 905,609, 21.1.54. — Schuff, assr to Ruhrchemie AG, Oberhausen (Rhld.). Process and installation for cat CO hydrogenation.

Ger.P. 906,932, 4.2.54. — Rottig, assr to Ruhrchemie AG, Oberhausen (Rhld.)-Holten. Method for producing cat for CO hydrogenation.

Ger.P. 907,050, 11.2.54. — Rottig, assr to Ruhrchemie AG, Oberhausen (Rhld.). Process for increasing yield of O_2-containing products in medium pressure synthesis of gasoline by cat CO hydrogenation.

Ger.P. 907,171, 11.2.54. — Rottig, assr to Ruhrchemie AG, Oberhausen (Rhld.). Process for separating O_2-containing compounds from products of cat CO hydrogenation.
BrennstChemie, 1954, **35** (5–6). R . T.

POLYMERIZATION

1222. Patents. Ger.P. 906,327, 28.1.54. — Hartmann and — Rabe, assrs to BASF, Ludwigshafen (Rhein.). Method for producing lub oils by polymerization or condensation.

Ger.P. 906,517, 28.1.54. — Rottig and — Liethen, assrs to Ruhrchemie AG, Oberhausen (Rhld.)-Holten. Method for producing polymerizates.

Ger.P. 906,377, 28.1.54. — Holzrichter, — Wolz, and — Ludwig, assrs to Farbenfabriken Bayer AG, Leverkusen. Process for polymerization of diolefin hydrocarbons.
BrennstChemie, 1954, **35** (5–6). R. T.

ALKYLATION

1223. Patent. Ger.P. 907,168, 11.2.54. — Kolling and — Rappen, assrs to Ruhrchemie AG, Oberhausen (Rhld.)-Holten. Method for producing alkylated aromatic hydrocarbons.
BrennstChemie, 1954, **35** (5–6). R. T.

ISOMERIZATION

1224. Patents. U.S.P. 2,661,383 (14.7.51; 1.12.53). La V. H. Beckberger and R. C. Woerner, assrs to Sinclair Refining Co. A process for producing benzene from a straight run C_6 cut petroleum hydrocarbon fraction in the presence of a molybdenum oxide reforming cat on alumina base containing a stabilizing proportion of silica.

U.S.P. 2,661,384 (14.10.49; 1.12.53). H. J. Hepp, assr to Phillips Petroleum Co. A process for the isomerization of a normally liq hydrocarbon material.

U.S.P. 2,662,925 (29.6.51; 15.12.53). D. A. McCaulay and A. P. Lien, assrs to Standard Oil Co. Isomerization of xylenes.

U.S.P. 2,662,926 (31.8.50; 15.12.53). A. P. Lien and D. A. McCaulay, assrs to Standard Oil Co. Pentamethylbenzene disproportionation. D. A. R.

Ger.P. 906,930, 4.2.54. — Koch and — Gilfert, assrs to Studien u. Verwertungsges.m.b.H., Mülheim (Ruhr). Process for isomerization of *n*-paraffin hydrocarbons, *e.g.* *n*-butane.
BrennstChemie, 1954, **35** (5–6). R. T.

CHEMICAL AND PHYSICAL REFINING

1225. Information on reactions and reaction velocities in regeneration of washing liquors of the metalthionate process for ammonia and hydrogen sulphide purification of coal gas. The manganese sulphate process. E. Terres, H. Buscher, and G. Matroff. *BrennstChemie*, 1954, **35** (5–6), 65–74.—In Pt I W. Feld's work is reviewed. An investigation of the reactions occurring in regeneration of used washing liquor is described, especially the effect of SO_2 on the washing process for pptn of metal sulphides alone, or in presence of dissolved ammonium salts. Contrary to Feld's assumption, the formation of zinc tetrathionate is the main reaction. In dissolving ZnS in aq SO_2 soln any thiosulphate formed is converted to polythionate. Zinc tetrathionate decomposes into $ZnSO_4$, SO_2, and S. Similar decomposition occurs with Mn salts. Numerous tabulations and charts. R. T.

1226. Treating gasoline by Dualayer process. C. A. Duval and V. A. Kalichevsky. *Oil Gas J.*, 12.4.54, **52** (49), 122.—The Dualayer process secures a doctor-sweet product by extracting mercaptans and not converting them to disulphides which remain in the oil. The system uses potassium hydroxide, water, and cresylic acid. The 3-component system is discussed and equilibrium curves displayed. Data show ease of mercaptan removal by the process. Regeneration is accomplished by less than 10 lb of steam/brl of gasoline charge. A typical flow diagram is provided. G. A. C.

1227. Patents. U.S.P. 2,661,094 (3.10.50; 1.12.53). W. B. Stewart, assr to Shell Development Co. Variable volume separator for liq.

U.S.P. 2,661,362 (26.11.47; 1.12.53). E. F. Wadley and J. T. Horeczy, assrs to Standard Oil Development Co. Removal of oxygenated organic compounds from hydrocarbons.

U.S.P. 2,662,062 (26.8.50; 8.12.53). S. D. Sumerford, assr to Standard Oil Development Co. A process for desalting petroleum oils which comprises mixing the oil with a first body of water having a pH different from 7, passing the oil and water mixture into a second body of water having a pH adapted to neutralize the first body of water, and thereafter separating and removing the water fraction from the oil.

U.S.P. 2,663,669 (7.1.50; 22.12.53). B. C. Barnes, assr to Socony-Vacuum Oil Co. A process for the separation and recovery of a stabilized liq fraction from a wet hydrocarbon gas mixture.

U.S.P. 2,663,670 (4.12.51; 22.12.53). A. W. Francis and G. C. Johnson, assrs to Socony-Vacuum Oil Co. Resolving a hydrocarbon mixture containing aromatic and non-aromatic hydrocarbons into fractions of different degrees of aromaticity, by contacting the mixture with a solvent fluorocarbon.

U.S.P. 2,663,673 (26.5.41; 22.12.53). M. L. Kalinowski, assr to Standard Oil Co. Desulphurization of petroleum oils.

U.S.P. 2,663,674 (17.3.50; 22.12.53). J. H. Krause and R. H. Brown, assrs to Standard Oil Co. Removing mercaptans from a sour hydrocarbon dist which is higher boiling than gasoline with a minimum of colour degradation.

U.S.P. 2,664,170 (24.6.52; 29.12.53). J. P. Walker and C. O. Glasgow, assrs to National Tank Co. Dual control separation of gas and oil.

U.S.P. 2,664,384 (23.12.48; 29.12.53). B. C. Benedict, assr to Phillips Petroleum Co. Propane fractionation of reduced crude oil. D. A. R.

Ger.P. 905,243, 14.1.54. — Grosskinsky, — Huck, — Klemt, and — Umbach, assrs to Bergewerksverband zur Verwertung von Schutzrechten der Kohlentechnik G.m.b.H., Dortmund-Eving. Process for recovering $(NH_4)_2SO_4$ from gas containing H_2S and NH_3, *e.g.* coke plant gas.

Ger.P. 905,016, 14.1.54. — Becher and — Martinak, assrs to Koppers G.m.b.H., Essen. Process for recovering phenols from waste waters.

BrennstChemie, 1954, **35** (5–6). R. T.

SPECIAL PROCESSES

1228. Low temperature process advances. E. G. Ragatz. *Petrol. Refin.*, 1954, **33** (4), 115–17.—Stabilization of the retrograde condensate obtained from low temp separation of natural gas improves the yield of higher boiling fractions. Condensate at 50 p.s.i.g. and 20° F is fed to the top of a rectifying column and stabilized condensate withdrawn from the reboiler at 200° F. Quantitative data are presented here for typical stabilizer operations. R. D. S.

1229. Fischer–Tropsch synthesis: a study of the reaction mechanism. N. G. Basak and K. K. Bhattacharyya. *J. Inst. Fuel*, Apr. 1954, **27** (159), 195.—An attempt has been made to investigate stages leading to attainment of equilibrium on cat surface and the progress of synthesis reaction, from variations of composition of the exit gases after the start of the experiments. Results obtained have shown the steps involved in setting up the reaction equilibrium on an iron cat. A probable mechanism is outlined. 23 literature refs. D. K.

1230. 53 million gallons of B.T.X. annually. J. C. Reidel. *Oil Gas J.*, 29.3.54, **52** (47), 94.—The $15,000,000 plants of the Sun Oil Co at Marcus Hook, Pa, is described. It produces benzene, toluene, and xylenes from a naphthene conc using the Houdriforming and Udex processes. G. A. C.

1231. Patents. U.S.P. 2,661,267 (30.8.48; 1.12.53). H. O. Folkins, E. Miller, and H. Hennig, assrs to Food Machinery and Chemical Corpn. Process for producing carbon disulphide by reaction of hydrocarbon gases containing a substantial amount of C_3 and higher hydrocarbons and sulphur at *ca* 1112° F in the presence of a cat capable of promoting carbon disulphide formation.

U.S.P. 2,661,270 (14.10.47; 1.12.53). T. B. Hudson, assr to Phillips Petroleum Co. Manufacture of synthesis gas by the reaction of methane with steam to form a synthesis gas containing hydrogen and carbon monoxide with the hydrogen being in molar excess of the carbon monoxide.

U.S.P. 2,661,338 (13.12.48; 1.12.53). W. C. Lanning, assr to Phillips Petroleum Co. Method of removing carbonaceous matter deposited on the surface of a fluidizable iron cat which has become spent in the synthesis of hydrocarbons from carbon monoxide and hydrogen.

U.S.P. 2,661,361 (22.8.51; 1.12.53). W. B. Grandjean, assr to Ethyl Corpn. Manufacture of T.E.L.

U.S.P. 2,661,380 (20.2.51; 1.12.53). B. Orkin, assr to Socony-Vacuum Oil Co. Oxidative dehydrogenation of cyclic hydrocarbons.

U.S.P. 2,661,381 (28.4.50; 1.12.53). H. Pines and V. N. Ipatieff, assrs to Universal Oil Products Co. Dehydrogenation of a *cyclo*-olefinic hydrocarbon containing a geminal carbon atom.

U.S.P. 2,661,382 (25.7.51; 1.12.53). A. P. Lien and D. A. McCaulay, assrs to Standard Oil Co. Preparation of ethyl xylenes.

U.S.P. 2,662,000 (19.10.49; 8.12.53). P. A. Maschwitz, assr to Pure Oil Co. A continuous process for the production of sodium hydrosulphide soln which comprises contacting, in an absorption zone, a fresh aq absorbent with a gaseous mixture consisting essentially of normally gaseous C_2 and C_3 hydrocarbons and containing hydrogen sulphide in an amount between *ca* 0·25 and 20% by wt.

U.S.P. 2,662,004 (1.10.48; 8.12.53). L. P. Gaucher, assr to Texas Co. Method of preparing synthesis gas at elevated pressures.

U.S.P. 2,662,102 (29.3.50; 8.12.53). G. M. Whitman, assr to E. I. du Pont de Nemours and Co. A process of preparing *cyclo*hexene which comprises reacting ethylene with butadiene-1 : 3 in the proportion of at least 10 mol of ethylene to 1 mol of butadiene-1 : 3- at a temp of *ca* 100°–300° C and under a pressure of at least 100 atm.

U.S.P. 2,662,103 (18.12.45; 8.12.53). M. P. Matuszak, assr to Phillips Petroleum Co. A process for converting *iso*pentane to higher-boiling *iso*paraffins boiling in the gasoline range.

U.S.P. 2,662,845 (18.8.51; 15.12.53). W. C. Simpson and W. B. Wilson, assrs to Shell Development Co. Thermally treating and separating heavy hydrocarbon oils to produce and recover therefrom oil dist having improved cat cracking characteristics and a residue product in reduced amount which is readily blendable to fuel oil.

U.S.P. 2,662,860 (Netherlands 30.11.49; 15.12.53). W. F. Engel and P. Krijger, assrs to Shell Development Co. Method for the production of moulded alumina carrier and cat.

U.S.P. 2,663,622 (14.12.48; 22.12.53). W. W. Odell, C. E. Morrell, and H. W. Scheeline, assrs to Standard Oil Development Co. Preparation of carbon disulphide.

U.S.P. 2,663,744 (14.11.49; 22.12.53). S. J. Lukasiewicz and W. I. Denton, assrs to Socony-Vacuum Oil Co. Cat hydration of olefins.

U.S.P. 2,663,746 (28.4.50; 22.12.53). H. Pines and V. N. Ipatieff, assrs to Universal Oil Products Co. A process for preparing 1 : 2 : 4-trimethylbenzene which comprises catalytically dehydrogenating 1 : 1 : 3-trimethyl*cyclo*hexane in the presence of a platinum-containing cat and an alkyl halide to produce 1 : 2 : 4-trimethylbenzene and recovering 1 : 2 : 4-trimethylbenzene.

U.S.P. 2,664,336–7 (25.8.50; 29.12.53). P. W. Cornell, assr to Gulf Oil Corpn. Fluidized fixed bed process.

U.S.P. 2,664,338 (28.8.50; 29.12.53). P. W. Cornell, assr to Gulf Oil Corpn. Line and valve system for fluidized particle handling.

U.S.P. 2,664,339 (17.1.51; 29.12.53). P. W. Cornell, assr to Gulf Oil Corpn. Cat process.

U.S.P. 2,664,345 (27.8.49; 29.12.53). A. L. Kohl and C. L. Blohm, assrs to Fluor Corpn. Manufacture of sulphur from H_2S–hydrocarbon containing gases.

U.S.P. 2,664,347 (8.10.47; 29.12.53). A. R. Rehrig, assr to Phillips Petroleum Co. Cat chamber collector system.

U.S.P. 2,664,385 (30.8.51; 29.12.53). W. F. Wolff and C. E. Johnson, assrs to Standard Oil Co. A process for the extraction of an organic sulphur compound from a mixture thereof with hydrocarbons, which comprises contacting the mixture with an ester of a thiolsulphonic acid containing 2–20 carbon atoms per mol and separating a raffinate phase from an extract phase comprising the ester and organic sulphur compound.

U.S.P. 2,664,451 (24.10.49; 29.12.53). J. R. Owne, assr to Phillips Petroleum Co. Process of dehydrogenation. D. A. R

Ger.P. 905,013, 14.1.54. — Reppe, assr to BASF, Ludwigshafen (Rhein). Method for producing butanetriol-(1 : 2 : 3).

Ger.P. 905,015, 14.1.54. — Becher and — Martinak, assrs to Koppers G.m.b.H., Essen. Process for obtaining phenols.

Ger.P. 905,974, 28.1.54. — Johswich, assr to Demag AG, Duisburg. Process and plant for producing gases with definite CO–H ratio, *e.g.* for ore reduction.

Ger.P. 906,452, 28.1.54. — Krzikalla, assr to BASF, Ludwigshafen (Rhein). Method for producing dihalogen butane oxides.

Ger.P. 906,453, 28.1.54. BASF, Ludwigshafen (Rhein). Process for converting low-mol olefins with one *tert*-C atom in the mol into ethers.

Ger.P. 906,329, 28.1.54. — Böttcher, Kronach (Ofr.). Method for producing org compounds containing S. (Addn. to Pat. 865,903.)

Ger.P. 906,933, 4.2.54. — Canzler, — Krekeler, and — Leutner, assrs to BASF, Ludwigshafen (Rhein). Method for producing monochloro-hydrocarbons.

Ger.P. 907,170, 11.2.54. — Büchner, assr to Ruhrchemie AG, Oberhausen (Rhld.). Method for synthetic production of alcohols from gas mixtures containing CO and H_2. (Addn. to Pat. 902,492.)

Ger.P. 908,013, 25.2.54. — Raichle and — Wittmann, assrs to BASF, Ludwigshafen (Rhein). Process for obtaining synthesis gases containing H_2.

Ger.P. 908,016, 25.2.54. — Wendlandt, — Hoffmann, and — Berg, assrs to Deutsche Gold- und Silber-Scheideanstalt, Frankfurt (M.). Process for cat addn of HCN to carbonyl and/or org materials containing carbon double bonds.

Ger.P. 906,931, 4.2.54. — Herbert and — Gross, assrs to Metallges. AG, Frankfurt (M.). Method for producing hydrocarbon mixtures.

BrennstChemie, 1954, **35** (5–6). R. T.

METERING AND CONTROL

1232. Instrumentation for precise fractionation. D. J. Bergman. *Oil Gas J.*, 12.4.54, **52** (49), 127.—High benzene quality may be obtained in the precise fractionation of benzene from toluene and xylene by utilizing a temp differential measuring element to position a flow controller on the column reflux. A differential vapour-pressure measuring element may also be employed. The measuring element should be located across a tray in the rectifying section below the top tray, at a point of appreciable temp gradient across the selected tray. G. A. C.

1233. Evaluation of new instruments. W. A. Crawford. *Oil Gas J.*, 5.4.54, **52** (48), 99.—Instrument evaluation is carried out to determine if new equipment can do a job better than old, and to find what new jobs can be done by the new equipment that cannot be performed by the old instrument. Evaluation by the du Pont Co is described, and includes visual examination, shop tests, and plant service. G. A. C.

1234. Frequency response analysis holds promise. J. E. Barber. *Oil Gas J.*, 5.4.54, **52** (48), 82.—The frequency response method, which is based on the use of sinusoidal impact pressures to study process equipment, yields curves which can be used to more completely describe controllers, properly to select controllers for specific jobs, and in some cases determine instrument settings.

Cataloguing of frequency response data will make possible the scientific selection of the proper controller for a given job.

The article is illustrated by frequency response diagrams for 2 and 3 capacity processes. G. A. C.

1235. An evaluation of cascade control systems. J. G. Ziegler. *Oil Gas J.*, 5.4.54, **52** (48), 95.—Reasons for cascade control systems are discussed and include the maintenance of a desired relationship between variables, accurate limitation of a secondary variable, reduction of load changes, non-linearities and discontinuities near source, and improvement of control circuit to reduce effective time lag. G. A. C.

1236. Some new aspects of cascade control. C. W. Bowden and H. Hartz. *Oil Gas J.*, 5.4.54, **52** (48), 92.—Cascade control is a system whereby 2 related variables are interlocked in one control loop. Where there are sufficient lags in a system to prevent precision results with a single controller is justification for cascade control; and regulation of output temp from a tube type furnace is an example. Cascade control in the manufacture of HCl, in absorber control, and in the control of a fractionator are also discussed. G. A. C.

1237. Continuous analysis of liquid plant streams by infra-red. L. W. Herscher. *Oil Gas J.*, 5.4.54, **52** (48), 87.—Partly through further adaptation of the present non-dispersing instruments, the use of infra-red analysis for liq streams is likely to expand at such a rate as soon to overtake gas analysers. The availability of spectrometer analysers will be responsible for the bulk of the expansion liq stream analysers; positive and negative filter types and a spectrometer type are described, sampling liq plant streams and the sampling problem are discussed.

Optical plans and electrical diagrams are provided. G. A. C.

1238. Measurement of pressure transients. R. T. Eckenrode and H. A. Kirschner. *Rev. sci. Instrum.*, 1954, **25**, 33–40.—A general review of fluid pressure transient measurement and instrumentation is presented. The review is designed to acquaint the reader with the basic problems encountered in transient measurement and to discuss the various types of pressure gauges available. The measurement problems include such topics as frequency response, thermal and electrical stability, calibration techniques, and interpretability of results. Some of the more important gauge types covered are mechanical, piezo-electric, condenser, strain, inductance, and optical. The discussion of these gauges includes a critical evaluation of the important characteristics of each, followed by a table comparing them with each other on the basis of these characteristics. With this background, the choice of a gauge best suited for a particular transient measurement problem should be facilitated. (Authors' abstract.) H. C. E.

PRODUCTS

CHEMISTRY AND PHYSICS

1239. Calculation of approximate values of eutectics of binary isomer mixtures. W. Wittenberger. *BrennstChemie*, 1954, **35** (5–6), 81–2.—An approximation equation for calculation of eutectic data: $T = \frac{\Delta J \,.\, T_s}{\Delta J + 0{\cdot}00457 \,.\, T_s \,.\, \log \frac{100}{p_s}}$ is developed stepwise from the 2 melting point straight lines of a binary isomer mixture. R. T.

1240. Process of carbon oxidation. K. Tamaru. *BrennstChemie*, 1954, **35** (5–6), 79–81.—Results of an X-ray estimation of the size of *a*- and *c*-parameters of crystallites of acetylene black, after heating in air at *ca* 570° C in a quartz tube, are reported. The *c*-parameter of the crystallites, *i.e.* the average ht of the agglomerates built up of plane mol increases with progressive oxidn, while the *a*-parameter, or average dia of the layers, remains const at first, then begins to grow after half the material is consumed. The increase in the *c*-parameter is determined by the favoured consumption

of the smallest plane agglomerates. The No. of small agglomerates in the C can decide its ignition temp. The micelles of the smaller plane agglomerates are assumed to play an important part in C ignition. In wet oxidn the average val of c-parameter remains const almost throughout, whilst the a-parameter increases distinctly. R. T.

1241. The viscosity–temperature function. A. V. Brancker. *Industr. Chem. Mfr*, 1954, **30**, 112–18—Knowledge of variation of visc with temp, pressure, and concn required in solving many problems connected with fluid flow and heat and mass transfer. Upper and lower limits of visc for liq are *ca* 10^{-3} and 10^{9} poises, for liq helium and molten glass respectively, hence, although many visc–temp equations have been proposed, these apply over only limited visc range. The exponential equation

$$\mu = \frac{aT}{\beta}\left[\left(\frac{R}{\epsilon}\right)e^{\beta\epsilon/RT} + \left(1 - \frac{R}{\epsilon}\right)e^{\beta/\epsilon}\right]$$

(a modified form of the original Reynolds equation) is developed for liq, where μ = visc, T = temp, a = const, β = crit temp, R = gas const, ϵ = entropy. Value of second term of this equation becomes important only at low values of μ (*i.e.* at high temp); *e.g.* in the case of polyethylene glycol, at $T = 233°$ K, value of 1st term of equation (cp) is 16,140 and of 2nd term 0·156; at $T = 561°$ K, corresponding values 0·037 and 0·376 respectively. Equation also applied to gases, though μ then becomes ϕ (fluidity) and β is dissociation temp. A. C.

ANALYSIS AND TESTING

1242. Electrographic spot testing of bearing surfaces. A. E. Roach and A. O. DeHart. *Lubric. Engng*, Dec. 1953, **9** (6), 302–6.—Electrographic spot testing is an extension of the use of chemical spot tests employing electrolytes in place of dissolving agents and depending upon electrodeposition rather than diffusion. The equipment used in the application of the process to the examination of bearing surfaces is described, and its use in the identification of white metals and embedded particles, in the investigation of bond failure, metal transfer, segregation of alloys, corrosion, and wear is explained in some detail. A list of electrolytes, reagents, and interfering materials for the spot testing of various metals and the sulphides is presented, and those metals and refractories are indicated for which no satisfactory electrographic tests are as yet known. J. G. H.

1243. Modified gear-wear tester. R. Steinbruch and L. C. Brunstrum. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Feb. 1954, **XVII** (11), 18–23.—Design and construction of a modified U.S. Navy gear-wear tester is described which, for effective operation, must allow for a gear centre distance between 0·004 and 0·014 inches over that theoretically necessary. While the specified brass gear must be used to distinguish between diester and silicone greases, it was found that available lead-free brass gears gave low wear with silicone oils. J. G. H.

1244. Testing of used oils. C. L. Pope and D. A. Hall. *Lubric. Engng*, Feb. 1954, **10** (1), 24–8.—The value of the testing of used oils is discussed, and the significance of the following tests is considered in some detail: visc, acid no., interfacial tension, solvent extraction, ash content, precipitation, flash and pour point, rusting, oxidn, and foam, emulsion, and demulsibility tests. Discussion concerned itself with development of spectrographic testing techniques. J. G. H.

1245. Significance of grease testing. A. E. Baker. *Lubric. Engng*, Oct. 1953, **9** (5), 249–53.—The necessity of short time performance tests for the screening of new materials for grease manufacture is emphasized, and soap structure tests, consistency, structure breakdown, slumping, and channelling and bleeding tests are described, with details of operation and significance, together with standard tests for volatility and visc of the oil component. The significance of oil content and acidity in used grease evaluation are indicated, together with the future possibilities of spectra study. J. G. H.

1246. Copper analysis by flame photometry. J. H. Jordan. *Petrol. Refin.*, 1954, **33** (3), 158.—The proposed method consists of extracting the copper from the gasoline with dilute hydrochloric acid and determining the copper content of the acid extract by use of a flame photometer. Results are reproducible within $\pm 10\%$, and agree well with those obtained by conventional chemical analysis, which takes twice as long. R. D. S.

1247. Determination of oil absorption: a new method. F. M. Smith and D. M. Stead. *J. Oil Col. Chem. Ass.*, Apr. 1954, **37** (406), 194.—The method involves the addition of pigment to oil on the automatic muller. Results are claimed to be more reproducible and nearer to the true oil absorption value than those obtained by the B.S. method. D. K.

1248. Developing aviation fuels and lubricants. C. B. Davies. *J. R. aero. Soc.*, 1953, **57** (515), 700–8.—Illustrations are given of the research and development work necessary to improve existing products and to anticipate demands for new ones facilitating the advance in efficiency and performance of aircraft. Petroleum products considered include leaded gasoline, turbine fuel, lub oil, and various special greases and fluids. It is emphasized that laboratory successes must be followed up and proved by full-scale and flight tests. C. N. T.

1249. Interferometric determination of benzene in coke oven gas. W. Ohme. *Erdöl u. Kohle*, 1954, **7**, 73–7.—Total liq hydrocarbons (C_5 and above) can be conveniently determined by comparison of n of gas with that of gas freed from such hydrocarbons by adsorption thereof on activated C. Knowledge of mean mol. wt. and n of hydrocarbons in gas is necessary, but, for routine control, such determinations need be made only infrequently. Necessary technique described in detail. V. B.

1250. Blending two V.I. improvers. G. W. Wharton. *Petrol. Refin.*, 1954, **33** (3), 187–9.—Blending charts for single additives are subject to considerable error when applied to oils containing several additives. A method is described here for the preparation of blending charts to permit the accurate prediction of V.I. and visc of systems containing 2 or more V.I. improvers. The accuracy of these charts is within the precision of the ASTM procedures for visc and V.I. determinations. R. D. S.

1251. Determination of tetraethyl lead in ethylated gasolines. J. Tayan and E. Knezevic. *Nafta* (*Yugoslavia*), Jan. 1954, **5** (1), 14–19.—The authors discuss 6 methods for determining T.E.L. in ethylated gasolines, and recommend on the basis of their own results, which are described, the Komplexon method as the most suitable for the practice. The method is accurate enough and makes it possible to evaluate the O.N. of ethylated gasolines. (Authors' abstract.)

1252. Rapid method and apparatus for analysis of technical emulsions. H. Kohnle. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (3), 72–3.—Combined hot extraction and H_2O estimation. The illustrated apparatus and procedure are described for rapid separation of H_2O, binder, and filler. The process is rapid and has a wide range of applications. R. T.

1253. International standardization of materials testing. A specific case: insulating oils. H. Weiss. *Bull. Ass. franc. Tech. Petrole*, 1954 (104), 83–95.—History of transformer oil testing from 1927 onwards reviewed, with particular reference to activities of U.S.E.; C.I.G.R.E.; I.E.C. Work of permanent sub-committee of I.E.C. committee No. 10 has now reached stage when an interim test procedure (apparatus of ASTM 670–42 (A), 100° C, O_2, atm pressure, solid Cu cat; measure acidity and sludge) can be proposed. Requirements of cable and switch oils are briefly considered. Appendices give decisions of I.E.C. committee No. 10 (Stresa, 1949) and of the permanent sub-committee thereof (Stresa, 1949; Paris, 1950). V. B.

1254. Gas analysis by thermal conductivity. F. S. McDonald and K. A. Kobe. *Oil Gas J.*, 29.3.54, **52** (47), 98.—A method is described for analysis of streams containing gaseous constituents and LPG. A thermal conductivity method is used, but it is not claimed that it can be used in its present state of development for the tried but time-consuming processes in vogue at present. Schematic diagrams of electrical circuits are given. G. A. C.

1255. Investigation of higher hydrocarbons from Emsland crude. W. Fuchs and J. Neus. *Erdöl u. Kohle*, 1954, **7**, 151–3.—Spindle (**I**) and neutral oil (**II**) slack waxes obtained from same source as in previous investigation (cf. Abs. **1709**, 1952). Respective congealing pt and oil content were 37·5° C; 54·5° C; 3·9%; 11·9%. Analysis by urea-adduct formation and chromatography on Al_2O_3 (exptl details given). *n*-Paraffin content was **I** > 92%, **II** 39·5.% *n*-Paraffins of **I** had mean mol. wt. 300 and m.p. 37°–50° C. Balance in each case branched naphthenes, with small resin component in case of **II**. V. B.

1256. Liquid fractionation techniques in the analysis of petroleum products. A. Crozier. *Rev. Inst. franç. Pétrole*, 1954, **9**, 42–50.—Bibliographical review covering dist, selective adsorption, crystallization, thermal diffusion. Typical characteristics of dist columns (Vigreux, Fenske, Heli-Pak) are given. 108 refs. V. B.

1257. Simple process for total cyanide and iron estimation in waters and solid substances, also total cyanide and sulphur in used gas-purifying masses. A. Adelsberger. *BrennstChemie*, 1954, **35** (5–6), 75–9.—The method described is carried out at 130° C in the pressure vessel illustrated. Estimation of total CN and Fe cont in solids and soln containing CN compounds, and total ferrocyanide and elementary S in used purifying masses, is rapid. Tabulations and check analyses are given. R. T.

1258. Units of viscosity and their conversion. D. D. Fuller and P. L. Tea. *Lubric. Engng*, Dec. 1953, **9** (6), 307–8.—The basic concepts of visc are explained, and absolute, kinematic, and Saybolt visc are defined, while a nomograph is presented for the conversion of the various units with relation to sp. gr. J. G. H.

1259. Tool-blade wear test for cutting fluids. L. C. Hays and E. J. R. Hudec. *Lubric. Engng*, Feb. 1954, **10** (1), 20–3.—A method of evaluating cutting fluids in a lathe by measuring the wear of a blunt tool blade rubbed against a freshly cut surface under an applied load with a constant flow of cutting fluid to the work-piece is presented. The apparatus and the procedure employed are described in some detail, and the limited tests already carried out indicate that by modification of the test additional data on the properties of cutting oils can be readily obtained. J. G. H.

1260. Patents. Ger.P. 906,021, 28.1.54. — Grüss, assr to Siemens & Halske AG, Berlin u. München. Method for measuring surface temp by radiation meter.

Ger.P. 906,023, 28.1.54. — Endell, Braunschweig. Apparatus for measuring moisture cont of gases.

BrennstChemie, 1954, **35** (5–6). R. T.

CRUDE OIL

1261. Trace metals in the McMurray oil sands and other Cretaceous reservoirs of Alberta. J. Scott, G. A. Collins, and G. W. Hodgson. *Canad. Min. metall. Bull.*, Jan. 1954, **47** (501), 36–42.—Determinations have been made of the contents of vanadium, nickel, and iron in the McMurray oil-sand oil. A typical analysis show 360 p.p.m. vanadium pentoxide, 96 p.p.m. nickel oxide, and 106 p.p.m. iron oxide. A comparison of the data obtained with the amounts of these trace metals in representative crude oil of the Cretaceous formations of Alberta, shows that the oils are remarkably uniform in the sense that the ratio between nickel and vanadium is nearly constant for all the oils, from the heaviest to the lightest. From this evidence it is suggested that a common origin for all the oils is not impossible. The presence of metal-containing porphyrins in the heavy black oils and the absence of similar porphyrins in the lighter Cretaceous oils is taken to indicate that the heavy oils are precursors, rather than residue products, of the lighter oils. W. H. C.

GAS

1262. Method of predicting availability of natural gas based on average reservoir performance. R. E. Davis and L. H. Meltzer. *J. Petrol. Tech.*, Oct. 1953, **5** (10), AIMME Tech. Paper No. 3651, 249–58.—From an analysis of the production data of 49 extensively depleted gas reservoirs average performance curves have been constructed for the later life of the fields. These are based primarily on plots of the annual production expressed as a percentage of the initial reserves plotted against the cumulative production, similarly expressed. The figures were taken for the cumulatives when the rates were 15%, 10%, 7·5%, 5%, 3%, 2%, and 1% of the initial reserves. The data were grouped in various ways to examine the influence of different factors, such as depth, location, size of reserve, date of development, etc. Although there are appreciable differences between different reservoirs, it is believed that the average curve has considerable usefulness. An example is worked to illustrate the application of the curve to discover whether a given accumulation will meet the anticipated requirements over a period of 20 years. G. D. H.

1263. Natural gasoline production remains high. Anon. *Petrol. Refin.*, 1954, **33** (4), 138–9.—The production of natural gasoline and allied products in the U.S.A. is expected to continue rising in 1954, but at a decreased rate. Proved reserves of natural gas liq are estimated at 5·4 billion brl and and production in 1953 was 307 million brl. Production of natural gas in 1953 was 9·5 trillion cu. ft., twice as much as in 1945, and proved reserves now stand at 205 trillion cu. ft., compared with 148 trillion cu. ft. in 1945. R. D. S.

1264. Thermal conductivity chart for gases. A. I. Johnson and Chen-Jung Huang. *Chem. Engng*, 1954, **61** (2), 204–5.—The chart is based on the correlation between the ratio of the specific heats and the Prandtl number. Sp. ht. and visc must be known for the interpolation and subsequent extrapolation. D. M.

1265. Natural gas correlations. F. Zapffe. *Petrol. Refin.*, 1954, **33** (4), 142–9.—A set of correlations is presented to minimize the time required to verify the accuracy of the Orsat analysis of non-combustible gas content, or to permit the calculation of the quantity of inert gases directly from the determined heating value and sp. gr. of the natural gas. These 2 properties can also be used to estimate the gasoline content of the sample. R. D. S.

1266. El Paso Natural has big programme. B. M. Willis. *Pipe Line News*, Apr. 1953, **25** (4), 18–22.—A description of the operations of El Paso Natural Gas Co and the proposed expansion which will increase sales from 1200 to 1900 million cu. ft/day. S. R. H.

1267. Patents. Ger.P. 905,365, 14.1.54. — Gremmler, Kohlscheid (Kr. Aachen). Process for aspirating CH_4 in mining.

Ger.P. 906,094, 28.1.54. — Kuhn and — Martin, assrs to — Martin, Kiel. Installation and procedure for separating gas mixtures by artificial gravitational fields.

Ger.P. 906,253, 28.1.54. — Schneemilch, assr to Demag AG, Duisburg. Water-gas producer and operation.

Ger.P. 906,969, 4.2.54. — Hubmann, assr to Metallges. AG, Frankfurt (M.). Method for producing high-cal. val. rich gas by gasifying solid fuels with O_2.

BrennstChemie, 1954, **35** (4–6). R. T.

ENGINE FUELS

1268. The oxidation, decomposition, ignition, and detonation of fuel vapours and gases. XXII. The characteristics of the ignition and combustion of benzene in a carburettor engine as affected by heat load. R. O. King and A. B. Allan. *Canad. J. Tech.*, 1954, **32**, 22–48.—Benzene as a fuel was different from normal hexane, heptane, and pentane (cf. Abs. **1429**, 1953) in that under conditions of low heat load it was impossible, by altering the C.R., to obtain nuclear ignition. Benzene burnt so slowly that, under these conditions, it was not found possible to achieve a constant volume cycle, but by adjusting the C.R. and ignition timing a constant pressure cycle could be obtained. Under conditions of normal heat load a constant volume cycle could be obtained, with consequent increase in thermal efficiency. When using a " hot " variety of spark plug severe pre-ignition, with heavy pounding, could be induced, with the power falling to zero in 40 sec. The characteristics of combustion and ignition of benzene in the C.R.F. engine are shown to depend fundamentally on heat load. J. G.

1269. Mixture sampling. Development of a method for fuel and T.E.L. distribution study. A. L. Wachal. *Auto. Engr*, March 1954, **44** (3), 103.—Existing sampling techniques are described and their inherent disadvantages discussed. This new sampling method was developed to overcome these difficulties. A continuous sample of the cyl charge is passed through a small orifice situated in a miniature electric furnace which ignites the unburnt portion of the gaseous mixture, a sufficient quantity of oxygen being fed to the apparatus to ensure complete oxidn of the combustible. A cooled glass surface and glass wool traps are provided for the precipitation of the lead compounds, and the water in the exhaust gases is collected in a series of condensers. The dry exhaust gases are then analysed in an Orsat apparatus. From the results obtained the air-to-fuel and lead-to-fuel ratios can be calculated. 9 refs. T. T.

1270. Static electrification of petrols. E. W. B. Gill. *Nature, Lond.*, 1954, **173**, 398.—When petrol or toluene flows down a tube or through muslin or paper, it acquires a charge, the magnitude and sign of which is altered by the addition of alcohol. For example, 82 octane aviation spirit running down a tube acquired a charge of +1·5 e.s.u.; addition of 2% alcohol reduced this to zero. Continued addition of alcohol caused the petrol to acquire a negative charge, rising to −22 e.s.u. at 4% alcohol conc and falling to zero at 8% conc.

If a mixture with a negative charge is repeatedly poured down the same tube the negative charge decreases through zero, and finally the mixture acquires a positive charge rather higher than that of the original petrol. The composition of the mixture is not altered, for its electrical resistance remains that same.

The disappearance of the charge at high alcohol conc is due to the increased conductivity of the mixture. It appears that the negative charge is not due to the alcohol–petrol mixture, but to small amounts of a third substance (water ?), which is progressively removed by repeated pouring through the tube. H. C. E.

1271. Ignition of methane–air mixtures by rapid compression. N. P. W. Moore and J. R. Simonson. *Nature, Lond.*, 1954, **173**, 543.—Using a machine of fixed C.R. (14·7 : 1) and controlled preheat charge temp, combustion zones following adiabatic compression of methane–air mixtures have been charted. The results are plotted with the axes: inlet air temp and % methane in inlet air. Two convex curves are obtained, meeting at approx 225° C air temp and 5·5% methane; in the zone between the 2 curves combustion occurs as a blue flame, while to the right of the curves combustion occurs as a yellow flame.

As the blue ignition limit is approached there is a sharp increase in the CO concn, which falls sharply again with the appearance of the blue flame. Spectroscopic examination shows that the light emission in the blue region has a strong continuum of burning CO, whilst that of the yellow region has the continuum of carbon.

The yellow ignition occurs early in the cycle (4° before T.D.C.) and is marked by a steep pressure rise. The blue ignition, at the same temp (243° C) but with a weakened mixture, occurs late in the cycle (6° after T.D.C.) and shows a less steep rate of pressure rise.

The results show that the blue ignition reaction of methane can occur at very lean mixtures (down to 1·25% methane) under favourable conditions of temp and pressure. (Cf. Abs. **1277**, 1951.) H. C. E.

1272. Patent. Ger.P. 906,485, 28.1.54. — Tramm, — Kolling, and — Rottig, assrs to Ruhrchemie AG, Oberhausen (Rhld.)-Holten. Method for producing high-grade aviation gasoline from pet gasolines.

BrennstChemie, 1954, **35** (5–6). R. T.

GAS OIL AND FUEL OIL

1273. Influencing oil ash deposits in industrial gas turbines by combustion control. P. T. Sulzer. *Schweiz. Arch. angew. Wiss.*, 1954, **20**, 33–41.—Varying results in different turbines using same fuel point to combustion conditions vitally affecting ash deposition. Fouling can be reduced by deliberate deterioration of combustion conditions by one of following methods: (1) insufficient air; (2) poor mixing, although excess air present; (3) excess of primary air to lower temp; (4) poor atomization. Tests on basis of (3) show very marked deposit reduction, coupled with thermal loss of ½–1%. Detailed table of relevant characteristics of ash components (V, Na, K, Ca, Mg, Al compounds) given. Reactions of the V, Na, and alkaline earth compounds discussed and results given for oxidn of V_2O_3 and reduction (by C) of V_2O_5. With incomplete combustion (presence of C) typical corrosion caused by V_2O_5 cannot occur as V remains in form of high-melting V_2O_3 or V_2O_4; good atomization is, however, essential. Incomplete combustion as a possible cure for fouling still involves problems requiring investigation, such as soot deposition, complex regulation at part load, etc. V. B.

LUBRICANTS

1274. Lubrication of gears. Pts 1, 2, 3, 4. Anon. *Sci. Lubric.*, Jan. 1954, **6** (1), 13–17; Feb. 1954, **6** (2), 10–13; March 1954, **6** (3), 25–31; Apr. 1954, **6** (4), 10–14.—The functions of a satisfactory gear lubricant are discussed, and basic elements of gear lubrication set out and illustrated. The importance of film strength is emphasized, as is also the fact that E.P. oils cannot solve all gear problems, and the essential properties of gear lubricants under conventional conditions are enumerated.

Special requirements and methods of application of lubricant to open gearing are discussed, together with splash lubrication of enclosed worm gearing and the importance of maintaining an adequate oil level in gearboxes.

The special functions of spray lubrication are outlined, and installations employing this method are illustrated. Special requirements for automotive gearboxes are set out, and the functioning of the lub oil as hydraulic medium in automotive and marine transmission systems is described.

Manufacturers' recommendations for the lubrication of worm, spur, helical, and bevel gears are presented, together with those for shock loading and automotive gearboxes.

J. G. H.

1275. Turbine oils and turbine lubricating oil—Pts 2, 3, 4, 5. G. H. Clark. *Sci. Lubric.*, Nov. 1953, **5** (11), 10–17; Dec. 1953, **5** (12), 10–14; March 1954, **6** (3), 14–20; Apr. 1954, **6** (4), 15–17.—The use of turbine oil as a hydraulic medium for the operation of speed governing mechanism in the turbo-alternator is discussed and the governor system employed in the 50,000-kW " Parsons " turbo-alternator is described and

illustrated, with special reference to the part played by the oil. The operation of turning gear is discussed, together with that of main and auxiliary oil pumps and jacking pumps.

The development of the hydrogen cooled alternator is briefly sketched and advantages and disadvantages enumerated. The use of turbine oil in the sealing of glands to prevent leakage is discussed, and the main types of sealing and gas control systems in use are described and illustrated.

The functions and method of application of a flushing charge in a new turbine system are described, and the use of water washes, alkali solns, and solvent degreasers in older systems is discussed. Maintenance of turbine oil is considered from the standpoints of sweetening, filtration, and centrifuging, and conventional centrifuges are described in some detail.

Sampling procedure is outlined, and the significance of neutralization value, visc, interfacial tension, and sediment and water tests is indicated. The importance of recording test results for comparison over a period is stressed.

J. G. H.

1276. Open gear lubrication. H. W. Winkler. *Lubric. Engng*, Dec. 1953, **9** (6), 294–7.—Metallic soap base greases have been largely used for open gear lubrication, and the special properties of calcium, soda, and aluminium soap greases are outlined. The significance of film strength is emphasized, and modified Timken test procedure for its evaluation is described. The use of solvents in maintaining fluidity at the time of application is described, and the advantages arising therefrom are enumerated. The desirability of paying due attention to operating conditions is stressed, with special emphasis on temp. Other points discussed include lubricant contamination, mechanical protection of gears, and problems arising from metallurgical characteristics of piping used in centralized lubricating systems.

J. G. H.

1277. Lubricant requirements of gears as seen by a gear engineer. L. J. Collins. *Lubric. Engng*, Oct. 1953, **9** (5), 246–8.—Factors in gear design and operation which may affect lubrication efficiency include accuracy of tooth spacing, tooth surface finish, tooth modification, and extent of sliding velocity. Pitting, abrasive wear, scoring, burning, and rolling are described, and conditions tending to these failures are indicated. Case studies are presented of typical failures, together with steps to be taken for their correction.

J. G. H.

1278. Additives for lubricating greases. R. T. Macdonald and J. L. Dreher. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Apr. 1953, **XVII** (1), 16–26.—The functions of additives in lub greases are briefly reviewed, and rust preventives, E.P. agents, and oxidn inhibitors are discussed in detail, together with methods of test and materials used. Fillers, colouring agents, anti-bleeders, and stringiness agents are also briefly considered. J. G. H.

1279. Lubrication of non-metallic bearings and gears. A. E. Williams. *Sci. Lubric.*, Jan. 1954, **6** (1), 20–4.—The various types of non-metallic materials used in the manufacture of laminated gears and bearings are described and their specific advantages noted. Asbestos-based, self-lubricating, and fabric bearings are discussed in some detail and sound lubricating practice indicated. J. G. H.

1280. Scoring and wear of spur gears. V. N. Borsoff and F. C. Younger. *Lubric. Engng*, Oct. 1953, **9** (5), 259–62.—Details are presented of an investigation of load carrying capacity tests of spur gears in a conventional 4-square machine. Results with straight unreactive mineral oils showed the existence of a relation between the power transmitted and the product of lubricant visc and speed, which relationship is shown as a h.p.–ZN curve. From microscopic observation and weighing of test gears it was concluded that the h.p.–ZN curve divides gear operation into 2 regions, one below the curve, where the surfaces are separated by a thick oil film, and the other above the curve, where boundary lubrication prevails. Data obtained by independent operators by other methods confirmed that with the operation below the curve no scoring occurred. The use of E.P. additives enabled operation to be continued above the curve—however, wherever possible both gears and gear lubricants should be so designed as to operate below the curve. J. G. H.

1281. Foil bearing—a new departure in hydrodynamic lubrication. H. Blok and J. J. van Rossum. *Lubric. Engng*, Dec. 1953, **9** (6), 316–20.—The use of a thin cellophane foil stretched round a journal as the essential feature of a set-up for the study of hydrodynamic lubrication is described, and its use in the investigation of phenomena occurring under varying lubricant conditions is discussed. J. G. H.

1282. Selection and classification of motor oils according to operating conditions, with special reference to additive oils. M. Rossenbeck. *Erdöl u. Kohle*, 1954, **7**, 113–14.—Types of additive-oils outlined. Dangers of use of HD oils in petroil lubricated 2-stroke engines are explained, with illustrations. Wide use of such engines in Germany raises requirements not present in the U.S.A. Likewise, API classification "DS" oils (Supplement 2) have not, so far, been required in Germany. V. B.

1283. Oils for metal rolling. A. L. H. Perry. *Sci. Lubric.*, Feb. 1954, **6** (2), 14–20.—The functions of rolling oils in the cold rolling process are set out in detail, together with properties and methods of application. Special oils used in the rolling of steel, copper, brass, and aluminium are described and essential properties indicated. J. G. H.

1284. Cooling and lubrication of high speed cylindrical roller bearings. W. J. Anderson and E. F. Macks. *Lubric. Engng*, Oct. 1953, **9** (5), 263–8.—The increased severity of operating conditions encountered in aircraft-engine bearings has in no way been matched with a corresponding availability of experimental data on bearing performance at high speeds. Present paper reports research on lubrication and cooling of a cyl roller bearing in which heating occurs only by friction and churning within the bearing, high engine ambient temp being missing. The test bearing installation and procedure used are described in some detail with results obtained with 5 oils of widely different visc. It was found that minimum bearing temp resulted, load, speed, oil flow, and oil inlet temp being constant, with a low visc, low V.I. oil and minimum power rejection to the oil, at a constant bearing temp occurred when a low visc oil was used introduced at high inlet temp. Also in the visc range investigated, bearing temp increased with increasing oil visc when speed, load, and oil flow were kept constant, and a higher oil flow of a more viscous oil was required to maintain a constant bearing temp. J. G. H.

1285. Laboratory five-pound grease kettle. E. L. Armstrong. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Oct. 1953, **XVII** (7), 8–11.—Details are presented of the construction and features of a 5-lb grease kettle used for the preparation of small batches of experimental greases under full scale conditions. Precautions to be observed in its use are noted and potential uses indicated. J. G. H.

1286. Fatigue spin rig—new apparatus for rapidly evaluating materials and lubricants for rolling contact. E. F. Macks. *Lubric. Engng*, Oct. 1953, **9** (5), 254–8.—A simple apparatus is described which was devised for the rapid evaluation of independent variables on the fatigue of balls and raceways over a wide temp range. This consists of a resiliently mounted raceway, a vertically adjustable nozzle assembly, and a vertically adjustable bottom plate. Pressurized air causes balls to rotate within the raceway, their speed being controlled by the air pressure. The theory and methods of operation are discussed, instrumentation requirements outlined, and modifications of the rig, facilitating special applications are indicated. Basic analyses of results obtained under varying conditions are presented. 63 refs. J. G. H.

1287. Textile mill lubrication. K. P. Powers. *Lubric. Engng*, Feb. 1954, **10**, 11–15.—Special problems and requirements encountered in the lubrication of bearing spindles, tenter chains, drafting system components, and twister rings are discussed. J. G. H.

1288. Lubricants for drawing metals. A. A. Brown. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Nov. 1953, **XVII** (8), 8–21.—The functions of metal drawing lubricants are briefly noted and special conditions obtaining with coated wires are discussed. The special properties of fats in relation to lubrication are indicated, and their occurrence and method of functioning are described. Other points considered include lubricant stability, possible corrosive effects, and ease of lubricant removal. J. G. H.

1289. Air bearings—low friction. D. D. Fuller. *Lubric. Engng*, Dec. 1953, **9** (6), 298–301.—The advantages and applications of bearings lubricated by air are briefly enumerated, and the basic theory of air lubrication is discussed at some length, with descriptions of some recent demonstration installations. J. G. H.

1290. Critical rake angle method of evaluating cutting fluids. W. E. Lauterbach and E. A. Ratzel. *Lubric. Engng*, Dec. 1953, **9** (6), 313–15.—The critical rake angle (CRA) method of evaluating cutting fluids has been developed from observations of chip formation and surface finish in 2-dimensional cutting operations. The set-up and procedure employed is described and illustrated, and the effect of various conditions on the CRA is discussed. CRA must be defined for a specific depth of cut, and its usefulness is limited to low cutting speeds. J. G. H.

1291. Air bearing studies at normal and elevated temperatures. J. D. Pigott and E. F. Macks. *Lubric. Engng*, Feb. 1954, **10** (1), 29–32.—The historical development of the use of air as a lubricant is briefly surveyed, and details are presented of experimental studies carried out with a 6-inch outside dia externally-pressurized, parallel surface, non-rotating, air-thrust bearing at temp up to 1000° F. Theoretical expressions describing the air flow through the bearing and through capillary tube resistances are presented as design equations and curves, and are compared with experimental results over a wide range of temp and loads. Results so obtained indicate that load capacity increases with increasing operating temp. J. G. H.

1292. Greases for electric motors. E. G. Jackson and E. R. Booser. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, March 1954, **XVII** (12), 8–25.—Essential properties for greases for electric motors, physical stability, lubricating qualities, bearing protection, low torque resistance, and chemical stability are discussed in detail, and a proposed specification for an ideal electric motor grease is presented. The discussion emphasized the desirability of specifications being sufficiently elastic to take care of varying operating conditions. J. G. H.

1293. To mix—or not to mix; study of wheel bearing compatibilities. M. Erlich and F. S. Sayles. *Inst. Spokesm. nat. Lubric. Gr. Inst.*, Feb. 1954, **XVII** (11), 8–17.—The significance of grease compatibility in field operation is emphasized, and details are presented of an investigation using a modified ASTM wheel bearing grease tester. The procedure employed and results obtained with a wide range of mixtures are described, and factors leading to deterioration in performance are summarized as variations in bases used, proportions in the mixture, and actual greases admixed. Distinction is drawn between mixtures and contamination. J. G. H.

1294. New theory of metal transfer and wear. I. M. Feng. *Lubric. Engng*, Feb. 1954, **10** (1), 34–8.—The molecular and welding theories of metal transfer and wear are briefly summarized, and a new theory is presented which puts forward the mechanical interlocking effect of plastic roughening of the interface of contacting high spots as the primary cause, with the adhesion process induced by high temp flash during the breakage of high spots as the secondary cause. The apparatus and technique used in arriving at this theory, together with the supporting experimental results, are described elsewhere. 12 refs. J. G. H.

1295. Some lubrication problems with roller bearings and their solution. R. H. Dubois. *Lubric. Engng*, Feb. 1954, **10** (1), 16–19.—Problems discussed include channelling of heavy greases, seal failures, spalling, overheating, and smearing. Difficulties encountered with gas turbine lubrication are considered, and visual means of detecting distress in high speed roller bearings are indicated. J. G. H.

1296. Mechanisms of sleeve bearing failure. P. B. Burgess. *Lubric. Engng*, Dec. 1953, **9** (6), 309–12.—It is possible, by careful observation of damaged bearings, to deduce the particular failure mechanism which has produced a given state of disintegration of metallic structure. Each of the general failure mechanisms—deformation, rupture, abrasion, corrosion, and melting—is discussed and its effect on the bearing surface indicated. J. G. H.

1297. Accuracy of engine wear investigation by the radioactive tracer method. Yu. S. Zaslavskii, G. I. Shor, and F. B. Lebedeva. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1954, 54–60.—Simultaneous wear tests (30–45 hr) carried out on single cyl engine by radio-active tracer, wt loss of piston rings, change in ring markings, analysis of oil for Fe. Uniformity of distribution (radial and diametric) of activity (Fe^{59}) of irradiated top ring checked. Tests at coolant temp of 20°, 30°, and 65° C, and with 2 oils, straight and + additive. All results similar, indicating reliability of radio-active method. V. B.

1298. Patents. U.S.P. 2,661,318 (25.10.50; 1.12.53). F. H. MacLaren and L. P. Schwartz, assrs to Standard Oil Co. Trough greases and process of preparing the same.

U.S.P. 2,661,335 (28.9.51; 1.12.53). J. M. Butler, assr to Monsanto Chemical Co. An improved grease which comprises a petroleum fraction containing from one to 20% of a fatty acid soap and from 0·01 to 5% of a compound made by the alkylation of a polystyrene having a mol. wt. between 150,000 and 1,000,000, the alkyl group of the alkylated polystyrene having at least 4 carbon atoms, and a total substituent having an average of from 6 to 12 carbon atoms per styrene ring.

U.S.P. 2,662,056 (30.6.49; 8.12.53). P. R. McCarthy, assr to Gulf Research and Development Co. A lubricant consisting essentially of a dispersion of a minor amount of water and a compound of a bentonite and an organic-nitrogen base in a major amount of a mineral oil, wherein the amount of bentonite compound in the lubricant is sufficient to produce a composition having the consistency of a grease and wherein the water is present in an amount sufficient to increase the consistency of the lubricant.

U.S.P. 2,662,057 (30.6.49; 8.12.53). P. R. McCarthy, assr to Gulf Research and Development Co. A lubricant consisting essentially of a dispersion of a compound of a bentonite and an organic nitrogen base in a major amount of a mineral oil and a diaryl amine, wherein the amount of bentonite compound in the lubricant is sufficient to produce a composition having the consistency of a grease and wherein the amount of diaryl amine is sufficient to stabilize the lubricant against oxidational deterioration.

U.S.P. 2,662,058 (30.6.49; 8.12.53). P. R. McCarthy, assr to Gulf Research and Development Co. A thixotropic petroleum lubricating jelly consisting essentially of a mixture of a major amount of a petroleum lub oil with a wax having a wax melting point above *ca* 120° F, the amount of wax being sufficient to provide an oil–wax mixture having a cloud point above *ca* 110° F, and having incorporated therein an amount of a compound of a bentonite and an organic nitrogen base

such that the ratio of bentonite compound to wax by wt is not greater than 1 : 1.

U.S.P. 2,662,059 (30.6.49; 8.12.53). P. R. McCarthy, assr to Gulf Research and Development Co. A lubricating composition consisting essentially of a dispersion of a compound of a bentonite and an organic nitrogen base in a major amount of an ester of an aliphatic dibasic acid, the ester having a majority of the properties of a hydrocarbon oil of lubricating grade, wherein the bentonite compound is dispersed in the ester in an amount sufficient to produce a composition having the consistency of a grease.

U.S.P. 2,662,815 (7.1.49; 15.12.53). H. W. Rudel, assr to Standard Oil Development Co. A hydrocarbon composition normally characterized by oxidn instability, *i.e.* gasoline, lub oil, and turbine oil, in which is dissolved an oxidn inhibiting quantity of N-nitrosodiphenyl amine.

U.S.P. 2,663,690 (16.2.51; 22.12.53). G. W. Eckert, assr to Texas Co. A ball and roller bearing grease capable of lubricating anti-friction bearings at high rotative speeds for long periods at a temp of 300° F containing as the essential constituents a major proportion of an oleaginous liq lubricating base, *ca* 15–25% by wt based on the grease of a sodium soap of a soap-forming fatty material containing at least 70% based on the fatty material of myristic acid, the soap thickening the lubricating base to a buttery grease-like consistency, and *ca* 0·5–8% by wt based on the grease of N : N′-diphenyl-*p*-phenylene diamine.

U.S.P. 2,663,691 (16.2.51; 22.12.52). J. P. Dilworth, assr to Texas Co. A lubricating grease composition comprising a lub oil, a metal soap of a fatty acid in grease forming proportion, a minor amount sufficient to impart thermal stability properties to the composition of N : N′-diphenyl-*p*-phenylene diamine added to the composition in soln in a minor amount of an oil-soluble phosphorus acid ester, the latter serving as a carrier and a dispersing agent for the N : N′-diphenyl-*p*-phenylene diamine.

U.S.P. 2,664,400 (13.8.49; 29.12.53). W. H. Woodstock and T. M. Beck, assrs to Victor Chemical Works. A lubricant for ferrous metals comprising a hydrocarbon oil and a rust-inhibiting quantity of an oil-soluble reaction product prepared by reacting a dioctyl acid ester of pyrophosphoric acid with 1–2·5 mol per atom of phosphorus in the ester, of an amine composition containing at least 70% of unsaturated aliphatic primary amines each having at least 18 carbon atoms in the mol until the reaction is substantially completed.

U.S.P. 2,664,436 (6.12.50; 29.12.53). R. L. Heinrich, assr to Standard Oil Development Co. A method for increasing the visc of an olefinic lub oil polymer having lub oil characteristics which comprises oxidizing the polymer at a temp in the range from 300° to 600° F in the presence of an oxidn promoter consisting of an amount not less than 0·1% by wt of quinoline to form an oxidized product having a substantially increased visc and a low neutralization value and recovering the product.
D. A. R.

Ger.P. 905,190, 14.1.54. — Clar and — Geiser, assrs to Ruhrchemie AG, Oberhausen (Rhld.). Process for pretreating synthetic lub oils.

Ger.P. 905,303, 14.1.54. — Orthner, — Balle, — Schulz, — Vogt, and — Basemann, assrs to Farbwerke Hoechst AG, formerly Meister, Lucius & Brüning, Frankfurt (M.)-Hoechst. Oils for metal processing.

Ger.P. 906,487, 28.1.54. — Hagemann, — Gottschall, and — Velde, assrs to Ruhrchemie AG, Oberhausen (Rhld.)-Holten. Method for producing high-grade lub oils from high-mol paraffins of cat CO hydrogenation.

Ger.P. 906,739, 4.2.54. — Clar and — Kühnel, assrs to Ruhrchemie AG, Oberhausen (Rhld.)-Holten. Process for improving synthetic lub oils, *e.g.* for obtaining higher ageing-stability.
BrennstChemie, 1954, **35** (5–6). R. T.

BITUMEN, ASPHALT, AND TAR

1299. Mechanical properties of bitumen. R. N. J. Saal. *Erdöl u. Kohle*, 1954, **7**, 70–2.—Main properties of bitumen from standpoint of its use as a constructional material are rigidity and fracture resistance. Rigidity can be considered as modulus of elasticity comprising both elastic and viscous components and which is time-dependent; its max value (approx $3 \cdot 10^4$ kg/cm²) is independent of nature of bitumen. Breaking stress for bitumens is likewise time-dependent, and at short loading has, for various types, max val of about 30 kg/cm². Bitumens of various types and hardness can be differentiated by rigidity–time curves for various temp, examples of which are given; these results are, broadly speaking, related to penetration and soft. pt. (R & B).
V. B.

1300. Colloid science of binders for road construction and building protection. K. Letters. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (3), 74–7.—The importance of colloid science is discussed in relation to clay, cement, and bituminous binders. The great interfacial effect of the unstable, multi-phase colloid system is shown by a max of strength, plasticity, elasticity, etc., during ageing. This may be illustrated by time-ageing curves. Thus, dynamic testing methods adapted to the special nature of the phenomena are necessary to clarify the questions of a colloid-scientific nature. The very marked discrepancy between laboratory and practice in evaluating colloid systems may be bridged over thereby.
R. T.

1301. Patents. U.S.P. 2,661,300 (6.7.49; 1.12.53). J. W. Romberg and R. N. Traxler, assrs to Texas Co. An asphalt cutback composition adapted for application to aggregate in road building and composed essentially of asphalt and naphtha in proportions adapted for application to aggregate in road building and *ca* 10–100 p.p.m. by vol of a liq lower dialkyl silicone polymer effective to suppress evaporation of the naphtha and increase the curing index of the cutback composition.

U.S.P. 2,661,301 (4.4.49; 1.12.53). R. G. Capell, assr to Gulf Research and Development Co. A composition of matter comprising a dispersion of a minor proportion of a compound of a bentonite and an organic nitrogen base containing at least 10 carbon atoms in an alkyl group in a major proportion of a composition consisting of asphalt, tar, or pitch, the amount of compound in the composition of matter being sufficient to increase the soft. pt. and improve the penetration characteristics of the composition of matter.

U.S.P. 2,661,302 (11.4.50; 1.12.53). J. W. Keith, assr to Texas Co. A process for preparing dense plastic compositions comprising asphalt cutback and asbestos filler which comprises adding volatile thinner containing a minute proportion of a liq lower dialkyl silicone polymer to asphalt to form an asphalt cutback, adding asbestos filler to the asphalt cutback and subjecting the silicone-containing mixture of asphalt cutback and asbestos filler to agitation at atmospheric temp. whereby air is rapidly released from the mixture and there is formed a dense plastic composition comprising asphalt cutback and asbestos filler.

U.S.P. 2,661,323 (18.11.49; 1.12.53). W. W. Kraft, assr to Lummus Co. Method of oxidizing a hydrocarbon residue to produce a blown asphalt of a predetermined degree of oxidn in a closed vertical vessel having an external attenuated circulation conduit.

U.S.P. 2,662,030 (24.11.50; 8.12.53). M. W. Stacy, assr to Standard Oil Co. Briquetting asphalt compositions.

U.S.P. 2,663,672 (1.4.52; 22.12.53). C. A. Draus and D. W. Young, assrs to Standard Oil Development Co. Upgrading an asphalt material which comprises reacting the asphaltic material with a halide derivative of SiH_4 at a temp of *ca* 200°–600° F for a period longer than *ca* ½ hr. D. A. R.

SPECIAL HYDROCARBON PRODUCTS

1302. New methods for preparing and preserving insulating oils and particularly complete transformers. K. Bayer. *Elektrotech. u. Maschinenb.*, 1953, **70**, 386–93.—Preferred system for oil purification is centrifuging under vac so as to present max oil surface and facilitate evap of H_2O and degassing; importance of latter stressed. Centrifugal atomization can give oil area of 30,000 dm^3/kg. System can operate at ambient temp, although slight heat (60° C) is advisable during first filling to ensure drying and degassing of windings by *in situ* circulation of oil through transformer and purifier. Schematic lay-out of de Laval installation given. Once-through treatment can raise breakdown to 300 kV/cm. Use of filter presses is contra-indicated, except in special cases (*e.g.* carbon in switch oil), when hard non-shredding filter paper should be used. Highly contaminated oils should be purified by preliminary atmospheric centrifuging. V. B.

1303. Patents. U.S.P. 2,662,029 (17.10.50; 8.12.53). K. N. Mathes and T. J. Rasmussen, assrs to General Electric Co. A composition of matter having a low electrical conductivity under high humidity conditions and consisting essentially of a paraffin wax having incorporated therein from 0·05 to 10% by wt of a polymethylchloropolysiloxane, based on the total wt of the latter and the paraffin wax.

U.S.P. 2,662,055 (25.8.49; 8.12.53). C. C. Towne, assr to Texas Co. A substantially non-foaming and non-gas entraining composition of matter comprising a major portion of a liq hydrocarbon oil and a minor proportion of an additive and a liq dihydrocarbon silicone polymer of a minimum visc of *ca* 900 cs.

U.S.P. 2,662,864 (2.11.51; 15.12.53). G. G. Rumberger, assr to Marathon Corpn. An improved synthetic rubber comprising a butadiene polymer and *ca* 1% to *ca* 10% based, on the wt of the rubber, of oxidized microcrystalline wax having a peroxide number in the range of *ca* 150 to *ca* 330 and an acid number less than *ca* 50.

U.S.P. 2,664,450 (Germany 18.5.50; 29.12.53). H. Sachsse, T. Kosbahn, and E. Lehrer, assrs to BASF. Process for the production of acetylene by incomplete combustion of hydrocarbons. D. A. R.

Ger.P. 906,451, 28.1.54. — Kern, assr to BASF, Ludwigshafen (Rhein). Method for producing glycol.

Ger.P. 907,291, 11.2.54. BASF, Ludwigshafen (Rhein). Method for producing higher-mol alcohols.

Ger.P. 907,648, 18.2.54. — Kölbel and — Ackermann, assrs to Rheinpreussen AG, für Bergbau u. Chemie, Homberg (Ndrh.). Method for producing hydrocarbons boiling chiefly above 290°.

Ger.P. 907,774, 18.2.54. — Pieroh and — Jorde, assrs to BASF, Ludwigshafen (Rhein). Method for producing polyvalent alcohols.

Ger.P. 908,135, 25.2.54. — Bauer, assr to BASF, Ludwigshafen (Rhein). Method for producing polyvalent alcohols.
BrennstChemie, 1954, **35** (5–6). R. T.

DERIVED CHEMICAL PRODUCTS

1304. Petroleum chemistry. J. Garantier. *Chim. et Industr.*, 1954, **71**, 555–7.—Main French companies operating petrochemical processes listed, with indications of products and capacity therefor. Brief notes giving overall petrochemical position in the U.K., Belgium, Italy, and Germany. V. B.

1305. Petrochemicals from refinery coke. E. L. Jones, F. D. Parker, and W. B. Strobel. *Petrol. Refin.*, 1954, **33** (4), 175–9.—A discussion of the possibility of ungrading coke to calcium carbide and then to acetylene, covering some of the economics of the coking and carbide processes, a description of the carbide process, and the possibilities resulting from acetylene production. R. D. S.

1306. Phenol from petroleum. Anon. *Petrol. Refin.*, 1954, **33** (4), 164.—Standard Oil Co's new process starts with the liq phase reaction between propylene and benzene to produce cumene, which is air oxidized to the hydroperoxide which undergoes acid cleavage, producing phenol and acetone. The plant, which went on stream at Richmond in March, is designed to produce 35 million lb of phenol and 20 million lb of acetone/year. R. D. S.

1307. Production of acetone by dehydrogenation of *iso*propyl alcohol. N. Plavsic and F. Jef. *Nafta* (*Yugoslavia*), Jan. 1954, **5** (1), 1–14.—In order to study cat activities in the production of acetone by dehydrogenation of *iso*propyl alcohol a number of flow experiments were carried out by passing *iso*propyl alcohol vapours over different cat preparations. (Authors' abstract.)

1308. Ethyl- and *iso*propyl-benzene. I. Production methods. P. W. Sherwood. *Erdöl u. Kohle*, 1954, **7**, 27–30. **II. Processing to styrene and phenol.** *Ibid.*, 154–6.—Cf. Abs. **1120**, 1954. V. B.

1309. Patents. U.S.P. 2,656,318 (31.12.49; 20.10.53). J. H. Bartlett, assr to Standard Oil Development Co. Mineral oil additive containing phosphorus, sulphur, and specified polymers.

U.S.P. 2,656,322 (4.1.49; 20.10.53). J. E. Eberle, assr to Phillips Petroleum Co. A cat consisting essentially of at least one metal of the group consisting of Al, Cd, Zn, and Cu coated with a solid material obtained by calcining a mixture of an acid which is an oxygen-containing acid of phosphorus, chromic acid, or tungstic acid, and the reaction product of the metal and acid. D. A. R.

COAL, SHALE, AND PEAT

1310. Patents. U.S.P. 2,661,327 (4.12.50; 1.12.53). D. Dalin. Apparatus for the destructive dist of oil shale.

U.S.P. 2,662,843 (25.5.51; 15.12.53). R. C. Castner and R. C. Archibald, assrs to Shell Development Co. Shale oil refining. D. A. R.

Ger.P. 905,733, 21.1.54. — Glinka, assr to Büttner-Werke AG, Krefeld. Process and plant for low-temp carbonization of oil shale, oil chalk, peat, or coal.
BrennstChemie, 1954, **35** (5–6). R. T.

MISCELLANEOUS PRODUCTS

1311. Polystyrene lattices in emulsion paint formulation: post-plasticized systems. H. Taylor. *J. Oil Col. Chem. Ass.*, Apr. 1954, **37** (406), 174.—The manufacture and properties of polystyrene lattices are discussed, and the importance of the plasticizer in ensuring the production of continuous films on drying is stressed. The methods of preparation of plasticized polystyrene lattices by "pre-plasticization" and "post-plasticization" are compared. Processes for preparation of the emulsion paints from post-plasticized lattices are described in detail, and the effect of ingredients on paint properties are particularly noted. Plasticizers, fillers, pigments, protective colloids, preservatives, dispersing and wetting agents, defoaming agents, and thickeners are ingredients dealt with in detail. D. K.

1312. The surface area measurement of paint pigments. P. C. Carman. *J. Oil Col. Chem. Ass.*, Apr. 1954, **37** (406), 165.—Only methods requiring simple apparatus and procedures and so suited to routine control are considered. A simple air permeability apparatus is described. Optical methods are discussed, but theoretical reasons are given for regarding these methods as unsuitable for the size range relating to paint pigments. 16 literature refs. D. K.

CORROSION

1313. Corrosion in sweetening units. Anon. *Petrol. Refin.*, 1954, **33** (4), 135–7.—A discussion of the extent of corrosion found in 2 solid bed copper sweetening units after 5 and 14 years service. Reactor vessels, storage tanks, and pipelines are considered separately. Corrosion of the storage tanks is greatest when handling treated gasoline, and is also increased by the use of a feed preheater. R. D. S.

1314. Laboratory methods for evaluation of inhibitors for use in oil and gas wells. E. C. Greco and J. C. Spalding, Jr. *Corrosion*, 1954, **10** (3), 103–9.—This article, a condensed version of a paper presented at the 9th Annual Conference and Exhibition of the N.A.C.E. at Chicago on 16–20 March 1953 presents the results of a questionnaire sent to 25 companies on this subject. No specific test is suggested by the authors, but data gathered from the companies canvassed indicate the majority working in this field rely upon the coupon weight-loss method. The article is followed by a discussion. W. G. R.

1315. Organic inhibitors improve ammonia control, reduce sulphide in refinery waste waters. J. J. Hur. *Corrosion*, Feb. 1954, Topic of the Month.—Deals with the use of semi-polar organic inhibitors to investigate corrosion in crude still overhead systems. These inhibitors may also reduce the sulphide content of waste condensate waters by making ammonia injection unnecessary. W. G. R.

1316. Status of fretting corrosion. Pts 1, 2. W. E. Campbell. *Sci. Lubric.*, Nov. 1953, **5** (11), 18–26; Dec. 1953, **5** (12), 18–22.—The development of the idea of fretting corrosion is briefly summarized, and the manner in which it differs from normal corrosion and wear phenomena is discussed, together with its effect on other agencies causing wear and failure. The conditions conducive to fretting corrosion are enumerated, and earlier work on these factors is described. They include surface finish, loading, closeness of fit, hardness, amplitude and frequency of vibration, stress corrosion effects, and ambient temp and humidity. The part played by the metal oxide formed in the earlier stages of the attack on the subsequent rate of corrosion is also discussed.

The existent theories of the mechanism of fretting corrosion are discussed, and on available evidence it is concluded that fretting is due to the repeated make and break of cold junctions at surfaces of contact undergoing oscillating relative motion, and this is accelerated for metals in air by oxidn of the virgin metal exposed. Attempts to identify fretting corrosion by the composition of the oxides formed are described, and a classification with definitions of the various wear corrosion phenomena encountered is presented. Measures conducive to the prevention of fretting enumerated include elimination or reduction of vibration, prevention of gross slip between surfaces, and the careful selection of lubricants to match special conditions encountered. The need for further research of a fundamental nature, together with more detailed quantitative study, is stressed. J. G. H.

1317. Patent. Ger.P. 906,786, 4.2.54. — Neumann, Bremen. Process for coating iron surfaces, *e.g.* inner surfaces of iron mineral oil tanks, with a corrosion-protective coat containing cement.

BrennstChemie, 1954, **35** (5–6). R. T.

ENGINES AND AUTOMOTIVE EQUIPMENT

1318. Engine research. The laboratories of B.I.C.E.R.A. Anon. *Auto. Engr*, March 1954, **44** (3), 115.—An account of the current research programme is given. This includes investigations into the problems of using heavy fuel in automotive diesels. Other items covered are a variable C.R. piston, a fuel injection system, an air compressor, a method for estimating crankshaft stiffness, and miscellaneous instrumentation. T. T.

1319. The Citröen 2 CV. A critical review of the engine design. Anon. *Auto Engr*, March 1954, **44** (3), 91.—The engine is comprehensively described and illustrated. The main details are: horizontally opposed twin cyl air-cooled; bore and stroke 62 mm × 62 mm; swept vol 375 cc; 4-stroke cycle; max b.h.p. 9 at 3500 r.p.m.; max b.m.e.p. and torque respectively 110 p.s.i. and 16·6 lb ft at 1800 r.p.m; C.R. 6·2 : 1; overhead valves, push-rod operated; 2-throw 2-bearing crankshaft, built up from 5 pieces; Solex carburettor; Guiot fuel lift pump. T. T.

1320. An oil burning heater. Anon. *Auto. Engr*, March 1954, **44** (3), 125.—This unit burns diesel oil or kerosine, and is intended for use on road passenger vehicles. The unit is described and illustrated, and the electrical circuit is given. Max heat output is 40,000 B.T.U/hr. T. T.

1321. Propelling machinery development in 1953. Anon. *Mot. Ship*, Jan. 1954, **34** (406), 406.—This paper gives a brief review of development in turbo-charged machinery, use of boiler oil, gearing, naval engines, and gas turbines. The output of diesel machinery for ocean going ships over 2000 tons for the U.K. and the world is tabulated for 1952 and 1953, and another table shows the different types of diesel machinery installed in ships in 1953, according to country. U. M.

1322. A marine gas turbine at sea. Anon. *Mot. Ship*, Jan. 1954, **34** (406), 451.—Extracts from the Lamb and Duggan paper "Operation of a marine gas turbine under sea conditions" were given in the Nov. 1953 issue of *Mot. Ship* (Abs. **546**, 1954). The present paper briefly reports the comments made on the performance of the *Auris* when the same paper was read to the Inst. of Mar. Engrs in Glasgow. U. M.

SAFETY PRECAUTIONS

1323. Apparatus for estimation of combustible gases and vapours in air. M. Kmiecik. *Bull. (Polish) Inst. Petrol.*, 1953, 3 (Suppl. to *Nafta* (*Krakow*), 1953, **9**).—The apparatus is based on measurement of temp rise due to cat combustion of the gas, is small and portable, supplied from a D.C. source of 6–12 V, consumes <0·3 A, and requires a 30-cc sample or flow <0·15 litre/min. Due to incomplete combustion of methane, one division on the scale corresponds to 0·007% C_3H_8 and as much as 0·035% CH_4. The apparatus can be manufactured calibrated for other gases. It should be valuable for geochemical prospecting, gas pipe leak detection, and ventilation of factory halls. Research for a better cat to improve CH_4 combustion is in progress. M. S.

1324. Prevention of occupational skin injury. A. Kirn. *Erdöl u. Kohle*, 1954, **7**, 90–1.—Main features and differences between eczema, fungoid infection, and oil acne are explained. Use of barrier creams is described, and particularly use of soap containing a protective medium (Imhausen O-48-G); main use of this is at present in coal mining. Other hand cleansers may appear more rapid and effective, but may have ill-effects on skin. V. B.

MISCELLANEOUS

1285. Petroleum review. Anon. *Petrol. Refin.*, 1954, **33** (3), 134–44.—A survey of U.S. production, stocks, and prices over the last few years based on U.S. Bureau of Mines figures. Predictions for 1954 include greater demand than in 1953, an increase in imports and a decrease in exports, and instability of prices. R. D. S.

1286. Petroleum-chemicals reviewed. R. F. Goldstein. *Petrol. Times*, 16.4.54, **58** (1479), 377.—The major plants in Great Britain producing chemicals, including synthetic rubber from petroleum, are briefly reviewed, chiefly from an economic angle. Plants in Europe, Australia, Canada, and the U.S.A. are similarly dealt with. A table lists the plants in Canada, showing raw materials and products. 32 refs are given.

G. A. C.

1287. Patents. Ger.P. 907,376, 11.2.54. — Knieste, Bottrop (Westf.). Device for quenching fires on high pressure gas cyl, *e.g.* acetylene cyl.

Ger.P. 907,379, 11.2.54. — Knieste, Bottrop (Westf.). Procedure and device for quenching fuel gas fires, *e.g.* on motor vehicles.

BrennstChemie, 1954, **35** (5–6). R. T.

BOOK REVIEW

Fourth Symposium (International) on Combustion. Standing Committee on Combustion Symposia. London: Baillière, Tindall and Cox. Pp. xx + 926. 54*s*.

It might be expected that the collation into one volume of the 112 papers presented at the fourth symposium on combustion held at the Massachusetts Institute of Technology in September 1952 would of necessity produce a somewhat heterogeneous work. It is very much to the credit of the organizers of the symposium and the editors of this volume that the book under review is not merely a record of the meeting but an important and readable account of the present state of knowledge in the topics with which it deals.

The fourth symposium on combustion was confined specifically in its scope to papers dealing with the physical aspects of combustion and particularly to wave phenomena and turbulence. The standard of the papers presented is excellent. The institution of a series of general survey papers, one on each of the main topics covered in the symposium, is a plan well worth noting for other meetings of this character. The inclusion of these survey papers in the present volume adds greatly to its range of appeal, for not only may the specialist find the latest developments in his subject but anyone with a general interest in combustion problems will find admirable background data on such wide topics as inflammability, ignition, burning velocity measurement, laminar flame structure, flame stability, and turbulent flame studies both for gas and liquid jets.

In a review of a book of this nature it is obviously impossible to single out any particular papers for discussion, but an idea of the scope of the volume may be obtained by a more detailed examination of the general topics considered.

The volume opens with the survey papers already mentioned and then follows a section on inflammability. This is concerned with work on inflammability limits, and constitutes a more or less classic approach to the problem. The subsequent section on ignition covers systems ranging from gaseous to solid and reflects the increasing work being carried out on liquid and solid propellants.

By far the largest number of papers is devoted to the study, both theoretical and experimental, of laminar combustion and detonation waves. The measurement of flame speeds and burning velocities figure largely in this section, but it is interesting to note the increasing attention being focused on the examination of the macroscopic structure of regions within the flame zone. Theories of flame propagation range from the detailed and exhaustive treatment of Hirschfelder and his collaborators to more empirical correlations of flame velocity with thermal conduction or radical diffusion processes.

An extremely interesting section of the volume is concerned with the relatively new studies on cellular flames and oscillatory combustion. These phenomena, once regarded as mere curiosities, are already yielding valuable information which can be applied to other branches of combustion research.

The latter half of the book is concerned with more complex flame systems. The studies on turbulent flames have emerged from the empiricism associated with them in the past, and the beginnings of theories of turbulent flame propagation are apparent. These theories have already postulated new and interesting concepts, such as that of flame generated turbulence.

Quenching and flame stability studies together with research on the behaviour of flame holders have already yielded much practical information which the technologist has been able to put to good use. The papers on these topics and on burning of fuel jets and fuel droplets are likely to increase such practical benefits. A small final section of the volume is concerned with combustion in rockets and jet engines. These serve to emphasize the complexity of the problems to be encountered in such systems, where aerodynamic and sonic effects may play a major role in governing combustion performance.

M. F. H.

ADDITIONS TO THE LIBRARY

British Diesel Engine Catalogue. Edited by D. S. D. Williams. 3rd Edn. London: Temple Press Ltd. for British Internal Combustion Engine Manufacturers Association, 1954. Pp. 305 + xliii. £2 15*s*.

The third edition of this useful catalogue illustrates and describes the engines manufactured by 37 members of BICEMA and the classified list of engine types indicates that details are included of 32 vertical and V-form and 12 horizontal industrial makers; 15 railway traction makers; 26 marine propulsion and 28 marine auxiliary makers; 5 dual-fuel and 4 gas engine makers; and 1 engine-compression set maker.

In the preliminary pages much useful data is given, such as a note on working principles, definitions of technical terms and tests, etc. For convenience in tracing engines of specific power and speed, special "lightning" indexes are provided which quickly lead the reader to details of all engines of the b.h.p. and speed he requires.

Some of the information likely to be of special value to overseas buyers is repeated in French, Spanish, and Portuguese.

ASTM Proceedings, Vol. 53, 1953. Philadelphia: American Society for Testing Materials. Pp. xii + 1197.

Oil for the World. S. Schackne and D'Arcy Drake. London: Esso Petroleum Co. Ltd., 1954. Pp. 99. 12*s*. 6*d*.

A brief introduction to oil for the general reader.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1328. Third and fourth dimensions in exploration. J. Daly. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 319.—The purpose in presenting this paper is to review for the geologist the geometrical principles involved in reflection seismograph data; to demonstrate that seismograph dips do not provide sufficient data to determine fault displacements; to point out that not all three-dimensional solutions are understandable, but some of them must be supplemented by a fourth dimension; and to plead again for better co-operation between geologists and seismologists.

Any exploration man who restricts himself to one approach to the problem of finding oil will impose upon himself a serious handicap which his more sagacious colleagues will avoid. Those individuals and those organizations which achieve the best co-ordination of all data will ultimately show a superior discovery record. E. N. T.

1329. Studies on origin of petroleum: occurrence of hydrocarbons in recent sediments. P. V. Smith, Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 377.—This is an important paper which provides valuable data on the origin of petroleum. The author describes the methods by which some 65 recent sediment samples from 31 different locations collected from some depth below the water sediment interface were investigated with a view to determining the presence of embryonic petroleum hydrocarbons therein.

It is claimed that definite traces of liq hydrocarbons have been found in a wide variety of salty, brackish, and freshwater deposits. Paraffinic, naphthenic, and a variety of aromatic components have been detected. The quantity of free hydrocarbons has varied from 9 to 11,700 p.p.m. of dried sediment. Extrapolation of data obtained on 2 cores from the floor of the Gulf of Mexico off Louisiana, and one core from the Santa Cruz Basin off California gives estimates varying from 4,500,000 to 10,400,000 brl of crude oil per cu. mile of sediments in these areas.

The recent origin of these hydrocarbons has been established by carbon-14 analysis. Possible sources of the hydrocarbons are discussed. E. N. T.

1330. Geologic use of self-contained diving apparatus. R. F. Dill and G. Shumway. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 148.—This paper describes some of the newly developed diving techniques and equipment which seem likely to make possible first-hand geological observations on the inner half of the Continental Shelf.

An aqualung training programme, instituted jointly by the Scripps Institution of Oceanography and the U.S. Navy Electronics Laboratory, prepares a scientist for underwater work after about 30 hr instruction.

Several simple geologic tools, such as an inclinometer, a sediment sampler, and a ripplemark measurer, have been developed for underwater use; watertight cases have been built for use with such instruments as compasses, stop-watches, photographic exposure meters, and cameras. Construction details and sealing techniques are discussed. E. N. T.

1331. Underwater mapping by diving geologists. H. W. Menard *et al.* *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 129.—The increasing interest now being felt in the possibilities of oil accumulation on the Continental Shelf has led to the development of techniques for mapping the geology of the off-shore sea floor.

The new technique was developed for mapping about 2 sq. miles of the Continental Shelf on the north side of San Nicolas Island, California. 2 mapping teams, each consisting of 2 divers and a recorder-navigator, operated in small boats based on a ship. 2 days were spent diving during a 4-day period. Outcrops were found at 26 of 28 stations, and dips and strikes were measured at 25 stations. E. N. T.

1332. Use of photo-logs of micro-facies in cemented sediments penetrated by wells. M. Rey. *Rev. Inst. franç. Petrole*, Feb. 1954, **9** (2), 39–41.—The stratigraphic laboratory of the Société Cherifienne des Pétroles has devised a technique whereby micro-photographs of thin sections of the rocks penetrated in a well are placed at the appropriate depths on the side of the electric logs. The thin sections are taken from cores and cuttings and photographed on 24 × 36-mm film with a uniform magnification of 3·5. The interpretation of the electric log is facilitated, and direct correlation can also be carried out by the comparison of the rock types. Furthermore, any variation in facies is revealed. G. D. H.

1333. Geology of Ham Gossett oilfield, Kaufman County, Texas. P. N. Wiggins. *Bull. Amer. Ass. Petrol.*, 1954, **38**, 306.—In the paper, the structure of the 11 reservoirs of the Ham Gossett oilfield is examined, and maps are presented which show the relation of the reservoirs to the anticlinal closure in the upthrown block against a normal fault.

There is more subsurface control through the entire Cretaceous section than anywhere else along the Mexia–Talco fault zone, and for the first time in this zone, oil production is also developed on an anticlinal ridge of low relief paralleling the fault in the downthrown block. E. N. T.

1334. Genesis of Oligocene sandstone reservoir, Seeligson Field, Jim Wells and Kleberg Counties, Texas. R. H. Nanz Jr. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 96.—Since oil accumulations are found only in or adjacent to sedimentary rocks, it is surprising that more attention has not been given to obtaining reliable information on the processes and products of sedimentation.

The author describes how character, distribution, and probable genesis of a typical lenticular oil-bearing sand body of the Gulf Coast Tertiary, namely, Zone 19B, an Oligocene sand of the Seeligson Field, Texas, were determined for the purpose of developing and defining criteria by which such sand bodies can be readily identified and delimited in the subsurface.

The stratigraphic framework was specified by cross-sections, fence diagrams, isopach maps, and facies maps, prepared from electric logs and core descriptions, and the sediments were characterized by size, shape, thin-section, X-ray, differential thermal, and chemical analyses.

The 4 principal results are: (1) the isopachal trend of the sand body is nearly normal to the regional depositional strike; (2) the sand grades from medium grain at the base to fine at the top and can be divided into 3 zones on max grain size; (3) a typical specimen is a mixture of well sorted sand, the framework size fraction, and the interstitial clay, the tail of the size-distribution curve, and also interstitial calcite cement; (4) the mineral composition is similar to that of a recent river sand, but dissimilar to that of beaches of the same geological province. E. N. T.

1335. Sun wildcat successful. Anon. *Oil Gas J.*, 15.2.54, **52** (31), 96.—1 Murch, 16 miles E. of Rio Grande, Hidalgo County, Texas, found gas and condensate in the Vicksburg sand at *ca* 6000 ft. Open flow potential was 1,930,000 cu. ft/day gas and 30 b.d. of 53° condensate. C. A. F.

1336. Louisiana strike reported. Anon. *Oil Gas J.*, 15.2.54, **52** (41), 96.—1 Godchaux, a wildcat 15 miles S. of Abbeville, Louisiana, flowed 386 b.d. of 37° oil from sand at 12,334–12,340 ft. A zone at 12,900–12,910 ft produced 5,500,000 cu. ft. gas and 275 b.d. condensate. C. A. F.

1337. Ecology of foraminifera and associated micro-organisms from Mississippi Sound and environs. F. B. Phleger. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 584.—This paper is based on a study of approx 400 samples from the area extending from Mobile Bay to Chandeleur Sound, and describes the distribution of foraminifera and some associated larger micro-organisms having hard parts, from Mississippi Sound and nearby marine and semi-marine areas.

The 4 main purposes of this report are: (1) to define the distribution patterns of the foraminifera and associated micro-organisms; (2) to interpret these patterns in terms of the known or inferred environmental factors; (3) to compare the distribution patterns with other similar areas; (4) to attempt to interpret the results in terms of possible geological applications. E. N. T.

1338. The possibility of oil in Arizona. F. J. Gardner. *Oil Gas J.*, 8.3.54, **52** (44), 157.—The oil possibilities of Arizona are briefly reviewed. 4 formations are potential oil-bearing rocks: the Permian (Supai), Pennsylvanian (Hermosa and Paradox), Mississippian (Redwall), and the Devonian (Temple Butte). The Cambrian and Devonian might also be locally productive. Good shows of Devonian oil have been found in NE. Arizona, but the main shallow objective in NE. and east-central Arizona is the Permian.

Stratigraphy in SW. Arizona is complex, and little drilling has been done. In the SE. the Cretaceous has possibilities. One well is currently drilling in the state: 1 Navajo, on the NE. flank of the Black Mesa Basin. This had oil and gas shows in the Pennsylvanian. Further exploration is planned. C. A. F.

1339. Harding and Fremont formations, Colorado. W. C. Sweet. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 284.—The author has made recent faunal collections from both the Harding and Fremont formations at 42 widely separated localities. The data accumulated in these investigations, and in the laboratory studies of the fauna involved, form the basis for this report.

On the basis of these geological investigations in Central Colorado, it is suggested that the Harding and Fremont formations are more widely distributed than was previously thought, and a detailed stratigraphical analysis of these units is presented. E. N. T.

1340. Stratigraphic and facies relationships of upper part of Green River formation and lower part of Uinta formation in Duchesne, Uintah and Wasatch Counties, Utah. C. H. Dane. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 405.—As a result of recent field investigations of facies changes in the Green River and Uinta formations of the Uinta Basin, Utah, it is pointed out that by recognizing and correlating in these sections many beds that can be regarded as time equivalents, it is possible to demonstrate: (1) that the upper oil shale facies of the

Green River formation of the western sections is traceable into, and is at least in considerable part correlative with, the Parachute Creek member of the Green River formation east of the Green River; (2) that the overlying barren facies of the western sections is similarly approximately equivalent to the Evacuation Creek member east of the Green River; and (3) that the saline facies of the western sections, hitherto regarded as a phase of the Green River formation, is stratigraphically, and in time, approximately equivalent to the lower part of the Uinta formation of the eastern sections. E. N. T.

1341. South Flat formation, new Upper Cretaceous formation of central Utah. R. E. Hunt. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 118.—Recent mapping in the northern part of the Gunnison Plateau of central Utah has revealed a new Upper Cretaceous unit, named the South Flat formation. The formation is thought to be medial Montanan in age, and is the first record of beds of this age in the Laramide folded belt of central Utah. Although the South Flat formation has been recognized only locally, it is considered important in the interpretation of eastern Utah stratigraphy and of the tectonic history of central Utah. E. N. T.

1342. Madison dolomite offers new Wind River Basin objective. J. A. Kornfeld. *Oil Gas J.*, 15.3.54, **52** (45), 196.—Recent discovery oil in commercial quantities in the Madison at Beaver Creek, Fremont County, Wyoming, has stimulated interest in the potentialities of this horizon in the Wind River Basin.

The stratigraphy and structural features of the basin are briefly outlined, and structural maps are included. C. A. F.

1343. Marine Upper Jurassic, Eastern Wyoming. J. A. Peterson. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 463.—The stratigraphy of the marine late Jurassic "Sundance" beds in the Powder River Basin, Eastern Wyoming, is described, and their relationship to the marine Upper Jurassic in adjoining regions is discussed.

Thickness maps indicate that the distribution of the Rierdon sediments in Eastern Wyoming was influenced by a minor depositional basin, the "Powder River embayment," corresponding in general with the present Powder River Basin.

The Swift sediments are lithologically and paleontologically distinct from those of the Rierdon, but show a less definite pattern of distribution, probably because of the ineffectiveness of the Sheridan arch during their deposition. E. N. T.

1344. Pennsylvanian and Lower Permian of Northern and Eastern Wyoming. R. S. Agatston. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 508.—The subject of this study is the stratigraphy of the Pennsylvanian and Lower Permian at the outcrop and penetrated by wells in that part of Wyoming E. of a line connecting the western Big Horn Basin to the western Laramie Basin.

The work was directed toward determining whether a definite trend of Pennsylvanian folding parallels the Big Horn–Laramie Mountains alignment as a northward extension of the ancestral Front Range uplift of N. Colorado. It concerns the lithologic character, age, and distribution of the Amsden, Tensleep, Casper, and Hartville formations. The paleogeography of the series is discussed, depicted, and related to adjacent states. E. N. T.

1345. Creataceous rocks of Williston Basin. J. P. Gries. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 443.—A review is presented of the general correlation of the Cretaceous sediments of the Williston Basin. Recent developments are described, and a summary is given of the known oil and gas showings within the Dakotas and eastern Montana.

Samples and electric logs of wells drilled in central South Dakota within the last few years have clarified the relationship between the Dakota and Fall River sandstones in the southern end of the basin.

It is thought that the areas where further attention might be given to the Cretaceous sandstones are as follows: (1) Fall River or Kootenai sands on any structural highs in eastern Montana; (2) Newcastle sandstone in stratigraphic traps around the flanks of the Black Hills; (3) tongues of true Dakota sandstone on the west flank of the Lemmon syncline in western South Dakota; and (4) Eagle and Judith River sandstones on untested highs along the Cedar Creek trend. E. N. T.

1346. Jurassic system in Williston Basin. D. Towse. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 454.—The author reviews earlier work in this area and incorporates the new data developed by recent drilling in the region.

The Jurassic system in the Williston Basin is divided into the thin non-marine Morrison formation at the top and the thick marine Ellis group below. No Lower Jurassic rocks are known, and the centre of Jurassic deposition was in western North Dakota, and a less extensive Jurassic basin was in southern Saskatchewan.

Oil has been produced in Wyoming, Montana, and Saskatchewan from rocks equivalent to the Sundance and Piper. Sundance sandstones and Piper limestones have suitable porosity, and may be found to be productive on structure elsewhere in the Basin. E. N. T.

1347. Discovery indicated. Anon. *Oil Gas J.*, 29.3.54, **52** (47), 63.—Devonian 9 Quinn, Burke County, Saskatchewan, on test flowed 6520 and 10,000 m.c.f. gas/day with 20 ft green condensate from Mission Canyon at *ca* 4600 ft. The well is in the Williston Basin and *ca* 55 miles from the nearest production in North Dakota. C. A. F.

1348. Bahaman calcareous sands. L. V. Illing. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 1.—This paper discusses the nature and origin of the mantle of calcium carbonate sands which covers the largest part of the Bahama Banks, and it is shown that the sand grains, oölitic and otherwise, are now in process of formation on the sea bed as a result of the extraction of calcium carbonate from the supersaturated shallow warm sea water. Contrary to earlier views, they are neither dominantly bioclastic nor derived from earlier deposits.

It is stated that the controlling factor in the formation and distribution of the sands is the tidal currents of cooler oceanic water which sweep on to the Banks with velocities diminishing toward the interior, precipitating calcium carbonate as the water warms and evaporates; and therefore sedimentation is most rapid along the borders of the Banks. This has led to the building of lines of elongate cays close to the ocean edge, making each bank a gigantic atoll. E. N. T.

1349. Revision of Lower Cretaceous stratigraphy of Venezuela. E. Rod and W. Mayne. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 193.—This comprehensive review illustrates the great progress that has been made in recent years in Cretaceous stratigraphy in Venezuela.

It draws attention to the fact that a number of vaguely defined or unsuitable type localities have hampered the general understanding of stratigraphical problems, and a revision of various formations is therefore proposed. Notable among these is the Cogollo formation in Western Venezuela.

It is also suggested that the interval between the Barranquin and Guayuta group should be subdivided into 3 formations, namely the Borracha, Chimana, and Boqueron formations. These in turn are subdivided into 3 members.

A tentative biostratigraphic comparison with the Lower Cretaceous of Texas is presented.

In Venezuela, several genera and species appear earlier in the Cretaceous time scale than in the Texas column, which suggests a migration of these faunal elements from the Caribbean Province into the Gulf Coastal Plain of the U.S.A. E. N. T.

1350. Progress reported. Development of Brazil's oil resources said satisfactory. Anon. *Oil Gas J.*, 15.2.54, **52** (41), 114.—Exploratory work has been carried out in the Brazilian states of Amazonas, Maranhao, and Panama; the Nova Olinda wildcat south of Manaos had core shows.

In Bahia new production was found at approx 1000 ft at Catu and at approx 4600 ft at Pojuca.

A plant is to be installed in the Paraiba Valley in Sao Paulo to produce 10,000 b.d. oil from extensive oil shale deposits near by. C. A. F.

1351. Egyptian well flowed. Anon. *Oil Gas J.*, 22.2.54, **52** (42), 126.—Feiran 2, on the west coast of the Sinai Peninsula, Egypt, on test flowed 2500 b.d. from 6828–6927 ft in Miocene sand. Oil was recently discovered in another well approx one mile to the east. C. A. F.

1352. Desert search pushed. Anon. *Oil Gas J.*, 15.2.54, **52** (41), 106.—During the next 6 years there will be intensive exploration of 72,000 sq. mile of the Western Desert, Egypt. Previous exploration in the area was unfinished; a well near Ras el Daba was abandoned as dry in the Upper Cretaceous at 6115 ft in 1940, and a well near Mersa Matruh was abandoned at 2240 ft in 1932.

Some geological and geophysical work was carried out immediately after the second world war. C. A. F.

1353. Exploration steps up. Anon. *Oil Gas J.*, 29.3.54, **52** (47), 78.—Exploration in the Sinai Peninsula of Egypt is being intensified, and 3 rigs are now operating. Feiran 2 tested 2000 b.d. of 22·8° oil in Miocene sand from 6798–6948 ft, and was being deepened to test further prospects. The discovery well on the structure is producing *ca* 90 b.d.

Further structures are to be tested at Baba and Belayim near by. C. A. F.

1354. More tests planned. Anon. *Oil Gas J.*, 15.2.54, **52** (41), 111.—Further tests are planned in Western Australia, where a 550-brl well was recently drilled in the Rough Range.

These include another well in the Rough Range to test the Cretaceous, and a test in the Cape Range and a well in the Fitzroy Basin.

The Rough Range discovery, 22 miles S. of Learmouth, found productive oil sand from 3605–3620 ft, and casing has been set at 3862 ft. The well has been deepened to test lower formations. C. A. F.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1355. New exploration tool. Anon. *Oil Gas J.*, 29.3.54, **52** (47), 61.—A new device has been introduced which makes a continuous record of the velocity of sound-energy travel in a well bore.

The sonic device consists of an ultrasonic signal generator which emits pulses at a rate of 20–30 per sec; this is separated by a 5-ft acoustical insulator from the receiver, and the whole instrument is 9½ ft long and 3⅜ inches dia. The travel time of the pulse between the generator and receiver is measured and plotted against depth on a special recorder. C. A. F.

1356. Patent. U.S.P. 2,668,282 (20.9.48; 2.2.54). O. C. Montgomery, assr to Phillips Petroleum Co. Transmitter for radio seismic systems. J. M. S.

DRILLING

1357. Filtration from mud during drilling. C. K. Ferguson and J. A. Klotz *J. Petrol. Tech.*, Feb. 1954, **6** (2), AIMME Tech. Paper No. 3749, 30–43.—Filtration from drilling mud may be that which occurs whilst there is no circulation, that occurring during circulation, and that taking place beneath the bit where filter cake cannot accumulate. All 3 types have been studied in a model well, in addition to being examined theoretically. Static filtration can be predicted by the classic filtration law, and dynamic filtration rates are higher, and it is concluded that 70–90% of the filtration is normally dynamic. Potential theory suggests extensive invasion below the bit, but the model studies indicate that mud particles entering the formation actually restrict the extent of invasion.

The data are presented and discussed in detail, together with an example of estimating invasion. G. D. H.

1358. New submersible barge. Anon. *Oil Gas J.*, 15.3.54, **52** (45), 85.—A drilling barge has been developed capable of drilling in water up to 45 ft deep. It is submersible, 200 ft long, 74 ft wide, and 12 ft deep. It will be able to mount a 2000-h.p. diesel-electric rig, and the control unit with equipment will be self-contained. Lowering to bottom will be carried out by auxiliary stabilizing pontoons, one end at a time. C. A. F.

1359. An experimental investigation of S.P. and resistivity phenomena in dirty sands. M. R. J. Wyllie and P. F. Southwick. *J. Petrol. Tech.*, Feb. 1954, **6** (2), AIMME Tech. Paper No. 3750, 44–57.—Experiments are described in which the effects of ion-exchange materials on the electrical properties of natural and synthetic porous media have been studied. The artificial sands were composed of Amberlite IR-120 spheres (synthetic cation exchanger) and glass spheres, in varied proportions to simulate sands of different degrees of dirtiness. It is concluded that the formation factor of a dirty sand derived from a series of formation factor measurements made using saturating soln of different conductivities may be a good approximation to the true formation factor of the sand, but theoretically it must always be somewhat less than the true value. As an approximation in moderately dirty sands and provided that muds of resistivities of about 1 ohm-metre or less at formation temp are used, qualitative analysis of electric logs of dirty sands can be made in the same way as for clean sands. In this procedure the apparent resistivity of the interstitial water in the dirty sand and the apparent formation factor must be obtained from the log records. G. D. H.

1360. Effect of temperature on the density and electrical resistivity of sodium chloride solutions. J. J. Arps. *J. Petrol. Tech.*, Oct. 1953, **5** (10), 17–20.—The S.P. measured in electrical logging is most commonly said to be given by $SP = -K \log_{10} \frac{Rmf}{Rw}$, where Rmf is the resistivity of the mud filtrate, Rw the resistivity of the connate water, and K is a constant varying between 50 and 110, with 70 a good average value. The use of this formula requires conversion of a mud filtrate resistivity measured at one temp to the value appropriate for some subsurface temp. Published resistivity and density data for sodium chloride soln have therefore been adjusted to a more convenient form for the above use. The adjusted data are presented in tabular and graphical form for a series of temp from 32° to 312° F, and concn of 60 to 200,000 p.p.m. of NaCl by wt. An empirical formula has been developed for making the resistivity conversions, and these seem sufficiently accurate for the above purpose.

$(Rw)t_2 = (Rw)t_1 \frac{t_1 + 7}{t_2 + 7}$, where t_1 and t_2 are the temp in °F, and $(Rw)t_2$ and $(Rw)t_1$ are the resistivities of the NaCl soln. G. D. H.

1361. Patents. U.S.P. 2,667,926 (12.8.48; 2.2.54). T. E. Alexander. Well cementing apparatus.

U.S.P. 2,667,929 (10.12.48; 2.2.54). G. R. Hunt. Wiper for strings engaged in wells.

U.S.P. 2,667,930 (6.4.48; 2.2.54). D. F. Saurenman and P. E. Hilton, assrs to Baker Oil Tools Inc. Casing scraper.

U.S.P. 2,667,931 (1.8.49; 2.2.54). R. C. Baker, assr to Baker Oil Tools Inc. Casing scraper.

U.S.P. 2,668,037 (28.10.50); 2.2.54). J. C. Stokes, assr to Reed Roller Bit Co. Core barrel assembly.

U.S.P. 2,668,593 (14.1.50; 9.2.54). L. E. Hay, assr to Sun Oil Co. Device for scraping and testing well tubing.

U.S.P. 2,669,118 (19.2.49; 16.2.54). C. R. Nichols, assr to Sperry Sun Well Surveying Co. Apparatus for mud weight determination.

U.S.P. 2,669,305 (20.11.51; 16.2.54). E. L. Condra. Retrievable cementing plug.

U.S.P. 2,669,428–30 (17.1.51; 6.11.51; 16.2.54). J. A. Zublin. Apparatus for drilling deviating bores.

U.S.P. 2,669,431 (24.4.48; 16.2.54). J. H. Crowell, assr to Crowell Consulting Co. Apparatus for drilling wells under water.

U.S.P. 2,669,688–90 (18.10.49; 13.4.45, 16.2.54). H. G. Doll, assr to Schlumberger Well Surveying Corpn. Well logging apparatus and methods.

U.S.P. 2,669,846 (23.8.49; 23.2.54). J. Shannon. Anchoring means for submerged well drilling equipment.

U.S.P. 2,669,871 (29.3.49; 23.2.54). A. Lubinski. Apparatus for measuring wear of a rotating bit attached to a rotary drilling string.

U.S.P. 2,669,872 (17.6.52; 23.2.54). D. G. Hartweg, assr to Dow Chemical Co. Apparatus for detecting movement of fluid in a well hole.

U.S.P. 2,669,928 (15.6.48; 23.2.54). W. G. Sweetman. Perforating gun for use in wells.

U.S.P. 2,670,048 (20.10.49; 23.2.54). P. I. Menaul, assr to Stanolind Oil and Gas Co. Porous formations in a well are sealed by injecting an acrylic resin dispersed in a solvent and then an anionic compound in soln in a liq miscible with the solvent to flocculate the resin.

U.S.P. 2,670,179 (13.2.50; 23.2.54). M. L. Natland and E. R. Pearson, assrs to Richfield Oil Corpn. Device for taking a punch core from a well bore and for indicating orientation of the core.

U.S.P. 2,670,225 (2.9.50; 23.2.54). H. E. McKinney, assr to Shell Development Co. Apparatus for forming a pressure seal around a columnar element during insertion into and removal from a high pressure wellhead.

U.S.P. 2,670,329 (3.8.50; 23.2.54). R. V. Jones, assr to Phillips Petroleum Co. Drilling mud comprising water, clayey material, and a water-soluble salt of chitin sulphate, carboxymethylchitin, or carboxyethylchitin.

U.S.P. 2,670,442 (25.4.50; 23.2.54). G. Herzog, assr to Texas Co. Radio-activity borehole logging apparatus.

J. M. S.

PRODUCTION

1362. Use of volumetric methods in reserve estimation. T. J. Nowak. *J. Petrol. Tech.*, Oct. 1953, **5** (10), 21–2.—The most appropriate method for making estimates of reserves depends on the purpose of the estimate, on geological and other conditions, and on the data available. In California recoverable reserve estimates are probably accurate to $\pm$ 15–20% in most fields.

Considerable judgment and experience are needed in applying the volumetric method. In California it may be difficult to fix sand thickness because of heterogeneity. Usually all rock with air permeabilities over 10 mD is considered as reservoir rock. Porosities range 14–35% in California and are mainly 19–27%. Interstitial water ranges 5–40%, and is commonly 20–30%. Recovery factors may be derived from comparable depleted fields, laboratory tests, mobility ratio curves, or a knowledge of the type of drive (depletion 15–28%, water drive 25–40%, gravity drainage 30–50%). Recoveries generally range 100–450 brl/acre-ft, with an average of 250 brl/acre-ft. G. D. H.

1363. Use of material balance method in reserve estimation. N. van Wingen and R. G. Hawthorne. *J. Petrol. Tech.*, Dec. 1953, **5** (12), 7.—The application of material balance to an oil reservoir was first suggested by Coleman, Wilde, and Moore, but was not widely used until developed by Katz and Schilthius. The latter equates original gas to that remaining and that produced, and has 3 unknowns: tank oil in place, gross water advance, and the ratio of gas cap and oil volumes. For soln drive, only the first is involved. Fingering may give uncertainty with water drive, and it is best to disregard advance temporarily, and find the tank oil volume for several periods; the apparent oil volume will increase with production, while extrapolation to zero production gives the true value.

Records of oil output are usually adequate, but the same is not always true for water and gas. Pressure data should be examined carefully for significance. The reservoir fluid properties call for proper sampling.

The estimate relates to "active" oil. Difficulties arise over the basic data, and undersaturated reservoirs are difficult to handle accurately. G. D. H.

1364. Gas condensate reserve estimations. H. Grant and C. R. McEwen. *J. Petrol. Tech.*, Dec. 1953, **5** (12), 9.—Lack of physical data make the use of material balance difficult, and the volumetric method is less satisfactory than for oil reservoirs. The P.V.T. method seems best, and uses depletion recovery curves for all plant products used. In addition, the number of acre-ft of reservoir pore volume must be known, as well as the plant extraction efficiency, and the amount of dry gas used for fuel. When some data have been accumulated a decline curve using pressure divided by the deviation factor of the well fluid *vs* cumulative production of well fluid can give the reserve in place/acre-ft of pore volume.

When cycling or pressure maintenance is applied other factors need to be considered, and altogether estimates are less satisfactory than for depletion. G. D. H.

1365. Effect of overburden pressure on relative permeability. I. Fatt. *J. Petrol. Tech.*, Oct. 1953, **5** (10), 15–16.—The permeability and porosity of sandstones are known to decrease under overburden pressure. Thus 10,000 p.s.i.g. reduced by 50% the permeability of a plastic mounted core. Sandstone test plugs 1 inch long and 1 inch dia were cleaned and mounted in lucite. Air permeabilities were measured, and porosity changes were obtained by measuring the expulsion of kerosine from the saturated plug. Relative gas permeabilities were measured by the stationary liq method. The internal pressure in the core was always near atmospheric, and the overburden pressure was that applied to the fluid around the core.

For 4 sandstones the relative gas permeability in the range up to 3000 p.s.i.g. overburden pressure was not affected by that pressure. Up to 5000 p.s.i.g. the porosity changes in the different sandstones were 1–5%, and the permeability changes 9–27%. G. D. H.

1366. Note on the calculation of the bottom-hole pressure of a gas well from surface observations. A. Tachet des Combes and J. Curutchet. *Rev. Inst. franç. Pétrole*, March 1954, **9**, 71–86.—The relationship between the top- and bottom-hole pressures of a closed-in gas well are first derived, and methods of making the calculation for a flowing well are given. These are due to the Railroad Commission of Texas, Lacroix and Smith, and Poettmann. The 3 equations are then used to calculate the B.H.P. of a gas well for which a direct B.H.P. is available. The calculated values were respectively 162·4, 161·5, and 161·7 kg/cm², the measured value being 162·0 kg/cm².

The Poettmann method is given in detail, and a table of the integral involved is appended. G. D. H.

1367. Description and analysis of an efficient continuous-flow gas-lift installation. A. F. Bertuzzi, J. K. Welchon, and F. H. Poettmann. *J. Petrol. Tech.*, Nov. 1953, **5** (11), AIMME Tech. Paper No. 3694, 271–8.—A series of gas-lift tests has been made, and the results, which are tabulated, confirm conclusions reached from previous studies, and indicate that gas-lift performance can be calculated if reasonably accurate data on the producing characteristics of the well are available. The test installation had a rate-of-flow controller to regulate the input gas, and an auxiliary string of ¾-inch tubing to lead the gas to the injection point on the 2-inch eductor tubing. The data have been plotted to relate fluid output, injection depth, and injection rate, as well as to link ideal adiabatic horsepower/brl/day. In general, it was concluded that for continuous gas-lift operation, injection should be as deep as possible consistent with available gas pressure and rate of production desired. G. D. H.

1368. Steady-state flow of gas through glass capillary tubes. G. C. Wallick. *J. Petrol. Tech.*, Nov. 1953, **5** (11), 20–3.—The pressure drop when nitrogen flows through a calibrated glass capillary is commonly used to measure gas flow through a porous sample. The calibration of a series of capillary tubes is described. The pressure differentials ranged 0–3 cm of mercury, the absolute pressures were 1·0, 2·5, 4·0, and 6·0 atm, and the capillary radii ranged 0·004–0·07 cm. Examination of the results revealed deviations from Poiseuille's law. The deviations could not be attributed to turbulence, but are described empirically by introducing the classical kinetic energy correction into the Poiseuille equation. G. D. H.

1369. Use of chemicals for the production of oil. W. H. Kirkpatrick. *J. Petrol. Tech.*, Oct. 1953, **5** (10), 11–12.—The overall oil production is accompanied by the production of considerable volumes of water. Often this means emulsions which are most commonly water-in-oil type. The breaking of emulsions by heat, centrifuging, or electrical treatment proved costly, and chemical demulsification was adopted. At first the equiv of soaps was used, and this was followed by sulphonated compounds, and later by resins. In the 1930s oil treating costs at Cayuga, Texas, were about 12 cents/brl; now they are of the order of one-tenth of this figure.

Corrosion-inhibiting chemicals are mainly semi-polar nitrogen-containing mol which form mono-molecular films on metals. Inorganic chromates also work by forming films. Paraffin inhibitors are mostly alkylated naphthalene derivatives which are absorbed on paraffin crystal surfaces and prevent further crystal formation. Scale controllers prevent the deposition of salts of Ca and Mg.

Chemicals are also used in acidization and fracture formation. G. D. H.

1370. Integrating well completion features. H. F. Hopkins. *J. Petrol. Tech.*, Nov. 1953, **5** (11), 13–15.—In making well completions the aim is to prevent transformational migration, and not to reduce the permeability of the producing formation. Cementing is affected by hole size relative to casing size, hole condition, filter cake, cement pumping rate, nature of cement slurry, and cement weight relative to mud weight. Analysis of electrical and caliper logs enables centralizers and scratchers to be placed most effectively. Laminar flow is preferable to plug-flow in pumping cement; the former may displace 90% of the mud, the later only 60%.

The special points to be considered in cementing pipe, protection, and production strings are noted. The practice of holding pressure on the casing after plugs are landed is becoming less common. Better cement jobs result when the casing is moved during the cementing operation. If further cementing is to be done it is best executed quickly before the mud in the annulus gels.

Successful temp surveys can be run much sooner than was previously believed. There is little lapse in time between the cement reaching its temp peak and the peak occurring in the mud in the casing opposite the cement. Max heat varies with the cement, the well temp, and possibly with the pressure. For a series of cements and conditions listed the temp peak occurs after 1·5–10 hr. G. D. H.

1371. Mile Six pool—an evaluation of recovery efficiency. E. L. Anders. *J. Petrol. Tech.*, Nov. 1953, **5** (11), AIMME Tech. Paper No. 3695, 270–86.—The Mile Six pool on the La Brea-Negritos structure in Peru produces from the Parinas sandstone at depths of *ca* 2200 ft. The structure is faulted and shows E. and NE. dips of 15°–20°. The Parinas formation is 635 ft thick, and *ca* 62% is effective reservoir of medium to coarse cross-bedded sandstone. Faulting appears to preclude water drive. Average porosity is placed at 22·6%, and air permeability 780 mD. Connate water is estimated at 35%. Stock-tank oil originally in place is calculated as 51,800,000 brl. Gas injection has been carried out during almost the whole producing life of the field, and the reservoir pressure has been kept within 200 p.s.i. of the original pressure of 965 p.s.i.a. Gravity drainage has dominated the production, and currently the recovery is 95% of the estimated ultimate, which is placed at 67% of the oil in place. The final residual oil saturation will be 19% of the pore volume. Recoveries have been low in up-dip wells; some down-dip wells have given more oil than they could be expected ordinarily to draw from their drainage areas. Gas injection has hastened recovery, and reduced lifting costs because most of the wells still flow. G. D. H.

1372. Effectiveness of gun perforating. T. O. Allen and J. H. Atterbury. *J. Petrol. Tech.*, Jan. 1954, **6** (1), AIMME Tech. Paper No. 3740, 34–40.—Laboratory and field tests have indicated considerable variation in the penetration achieved by different commercially available gun perforators. Some of the guns have been improved, yet recent productivity tests suggest inadequate penetration or ineffective penetration in some cases. Laboratory tests have been made in which well conditions are simulated—presence of mud with suitable pressure differentials, high temp, and eventual back flowing of oil. These have revealed the occurrence of plugging, probably in part due to the shot and in part to mud filtration. The plugging per unit of hole depth appears to be greater with jets than for bullets of comparable dia, but this is offset by greater penetration in the former case. Some observations suggest that shaped charges may give less shothole restriction, which may result from larger dia perforations or other factors connected with charge design. G. D. H.

1373. Simplified cementing technique for recompletion operations. T. A. Huber, G. H. Tausch, and J. R. Dublin. *J. Petrol. Tech.*, Jan. 1954, **6** (1), AIMME Tech. Paper No. 3739, 27–33.—Conventional high-pressure squeeze cementing has a number of drawbacks, some of which can reduce the chances of success. The new technique uses a small-dia lightweight tubing extension, run on a wire-line and set on a previously installed landing nipple in the tubing. The low squeeze pressure employed and the small cement volume are satisfactory when the wells are completed and re-worked with salt water or other penetrating fluids. The use of relatively low-water-loss cement allows excess cement to be reverse circulated, to leave the casing empty of cement for completions in the same or a lower interval. The technique reduces costs by eliminating the need for a conventional drilling or workover rig, the presence of contaminating mud, and the need for drilling out cement.

Details of surface tests are given. G. D. H.

1374. Hydraulic fracturing improves production in north and west central Texas. J. K. Henderson, J. A. Harmon, and W. B. Harley. *Oil Gas J.*, 22.2.54, **52** (42), 162.—Recent attempts to stimulate production in poor producers in north and west central Texas have been successful using the Sandfrac technique. Previous acidizing was reported to be generally unsuccessful.

The Sandfrac technique makes use only of sand and a special refined oil, and the risk of plugging the formation during fracturing is eliminated.

Some case histories and the properties of the fluid carrier and the propping sand are described. C. A. F.

1375. New fracturing idea. K. B. Barnes. *Oil Gas J.*, 22.2.54, **52** (42), 108.—A new type of gun perforator is briefly described; this can fire a bullet down a well bore, turn it through 90°, and direct it through the casing into the formations. It is claimed that the method has given substantial production increases on test wells where other perforating methods have not been successful.

The tool is actuated co-axially with the well bore, and a wide range of missiles can be adapted to various requirements. C. A. F.

1376. Fracturing boosts Red Fork sand production. A. Stegelman. *Oil Gas J.*, 22.2.54, **52** (42), 166.—Fracture jobs using large volumes of sand-propping agents are reported to have been successful in the Red Fork sand in eastern Oklahoma. Over 100 wells have been fractured using various methods, including the Hydrafac process; present methods use viscous oils as the carrying medium rather than hydrocarbon gels. C. A. F.

1377. Imbibition successful. R. J. Enright. *Oil Gas J.*, 29.3.54, **52** (47), 58.—Experimental water injection in the Driver area of the Spraberry trend, West Texas, has shown that recovery by imbibition is taking place. Production has been increased, or declines have been halted, since injection started.

Because of the fractured nature of the Spraberry sand and the tight matrix oil cannot be forced from the pores by conventional flooding, due to the risk of channelling, but in the imbibition technique the fractures are filled with water which is soaked into the matrix by capillary attraction, and oil is expelled into the fractures. Data on the experimental injection are included. C. A. F.

1378. An exploration of the Yuster effect. P. H. Scott and W. Rose. *J. Petrol. Tech.*, Nov. 1953, **5** (11), 19–20.—Yuster has called attention to the transfer of viscous forces across fluid–fluid interfaces in flow of immiscible fluids through porous media. Accordingly, the relative permeability–saturation function should be dependent in some measure on the visc of all the fluids contiguous to the fluid considered. Yuster adopted a capillary tube model in his analysis, but it must be noted that relative permeability data do not support the implication noted. The model adopted by Yuster seems to be at fault. Application of Yuster's technique to a modified model yields results more in keeping with experience, and gives a much narrower range of dependence of non-wetting fluid relative permeability on the visc ratio than Yuster obtained in his model. It is believed that the different phases flow mostly in separate channels. G. D. H.

1379. Effect of pressure and temperature on oil-water interfacial tensions for a series of hydrocarbons. M. E. Hassan, R. F. Nielson, and J. C. Calhoun. *J. Petrol. Tech.*, Dec. 1953, **5** (12), AIMME Tech. Paper No. 3711, 299–306.—The interfacial tensions of benzene, propane, *n*-pentane, *n*-hexane, *n*-octane, and *iso*-octane against water at temp of 26°–82° C and press of 1–240 atm have been measured by the pendant drop method. The design and construction of the measuring cell, and the optical system for photographing the drops are described. The results are generally in good agreement with these obtained by other workers, and show a slight decrease in interfacial tension with pressure increase at constant temp. The rate of decrease decreased with increasing pressure, but increased with increasing temp.

A known 1% impurity in one case did not change the results outside the limits observed with the pure substance. An empirical equation gives the interfacial tension values as a function of temp and pressures. A definite trend in behaviour was noted for the propane–*n*-octane series. G. D. H.

1380. Application of laboratory PVT data to reservoir engineering problems. C. R. Dodson, D. Goodwell, and E. H. Mayer. *J. Petrol. Tech.*, Dec. 1953, **5** (12), AIMME Tech. Paper No. 3710, 287–98.—The historical background of PVT analyses of reservoir fluids is given, and the limitations and techniques of sampling are described. The gas liberation sequence is complex, and laboratory studies should duplicate as closely as possible the phenomena occurring in the formation, flowstring, and surface separators. It is suggested that a combined differential and flash or "composite" liberation sequence is that which gives the closest approximation to working conditions. It is recognized that pressures and temp vary with structural position, and in thick hydrocarbon columns the properties of the fluids vary with structural position. To get representative data it may be necessary to sample and test the fluids from a number of wells, and to weight or average the data suitably before application with suitably adjusted pressure and temp data. G. D. H.

1381. Automatic lease operations—Weeks Island field, La. T. P. Northern. *J. Petrol. Tech.*, Jan. 1954, **6** (1), 21–4.—To test various types of automatic lease equipment for use in bay fields and offshore operations Gulf Refining set up suitable equipment on the Provost Cyr Unit lease on the east flank of the Weeks Island field. This had 5 wells, 4 1000-brl stock tanks, 2 125-p.s.i. oil and gas separators, one emulsion-type heater-treater, and a horizontal precipitator. The requirements for automatic operations are a tank switcher to transfer flow from one tank to another when a fixed fluid level is reached, but which cannot link with full tanks or those on pipeline run; to close wells when no tank space is available, when a failure in the equipment occurs, or when the well is producing on a fixed schedule. The electrical equipment, types of valves and float switches, and the nature of the various indicators are briefly described, while the costs are given. G. D. H.

1382. Calculations of unsteady-state gas flow through porous media corrected for Klinkenberg effect. R. E. Collins and P. B. Crawford. *J. Petrol. Tech.*, Dec. 1953, **5** (12), 19–20.—Equations have been derived which take note of slippage phenomena (Klinkenburg effect) in unsteady-state gas flow through porous media. It was assumed that slippage could be represented by an equation of the type $K = K\left(1 + \frac{b}{p}\right)$, because permeability to gas has been found to vary with pressure. It is pointed out that most of the existing data on unsteady state gas flow can be corrected by a simple change in the definition of the dimensionless groups. G. D. H.

1383. Computation of a linear flood by the stabilized zone method. J. Jones-Parra and J. C. Calhoun. *J. Petrol. Tech.*, Dec. 1953, **5** (12), 11–14.—The fractional flow and frontal advance equations were solved to give the oil recovery at water break-through as a function of the length of the system being flooded, the linear velocity of injection, and the displacing phase visc. It is assumed that a water front forms to sweep the oil ahead of it. The method of soln applies only when the stabilized zone has attained its equilibrium distribution. The water saturations at the front represent the stabilized zone.

The solutions have been applied to Rapoport and Leas' data, and the calculated results deviate from the experimental results, due largely to the use of steady state relative permeabilities and static capillary pressures. It is apparent that when the linear velocity varies, only the velocity at the outlet at break-through will fix the displacement efficiency. G. D. H.

1384. Some practical aspects of gravel packing. C. J. Rodgers. *J. Petrol. Tech.*, Jan. 1954, **6** (1), AIMME Tech. Paper No. 3741, 41–7.—The pressure pack technique has been used by the Gulf Oil Corpn on over 90 wells since May 1950. In this the gravel is placed in and adjacent to the producing formation under pressure, using a fluid which will permit partial or complete loss of returns to the formation during the operation. The pressure applied at the surface is equal to 100 p.s.i. plus the rock pressure at the perforated interval, minus the head of the fluid column. The procedure scours the casing perforations and creates additional drainage channels to the well bore.

Experience has shown that the pressure pack method gives sand-free production for a period sufficient to make the operation economically attractive. Data for the first 15 wells so completed show that to date $2.92 has been obtained for each $1 spent on the completions.

Details of the method are given, as well as information on individual wells treated. G. D. H.

1385. Patents. U.S.P. 2,667,927 (28.8.51; 2.2.54). M. O. Johnston. Valve for well testing tools.

U.S.P. 2,667,928 (23.4.48; 2.2.54). R. C. Baker, assr to Baker Oil Tools Inc. Production packer apparatus.

U.S.P. 2,667,932 (17.2.48; 2.2.54). A. G. Bodine. Sonic system for reducing the clogging of oil flow passages in a production well.

U.S.P. 2,668,500 (11.10.48; 9.2.54). T. P. Hoffer, assr to Otis Pressure Control Inc. 2-zone well pumping apparatus.

U.S.P. 2,668,517 (23.10.51; 9.2.54). C. R. Croft. Hydraulic oil well pump jack.

U.S.P. 2,668,553 (20.9.48; 9.2.54). J. H. Howard and P. R. Mills, assrs to Camco Inc. Flow valve for wells.

U.S.P. 2,668,554 (11.2.49; 9.2.54). W. H. Seyffert, assr to Camco Inc. Differential flow valve for wells.

U.S.P. 2,668,592 (4.6.49; 9.2.54). J. J. Piros and O. F. Campbell, assrs to Sinclair Oil and Gas Co. Method of producing hot combustion gases at an input well for the thermal recovery of oil and gas.

U.S.P. 2,669,190 (22.9.50; 16.2.54). E. J. Mullins, assr to A. H. Bakke. Oil well pump.

U.S.P. 2,669,306 (17.12.48; 16.2.54). J. W. Teter and B. S. Friedman, assrs to Sinclair Oil and Gas Co. Petroleum production by introducing a liquefied normally gaseous hydrocarbon (A) through an input well while holding back pressure on an outlet well, forcing a layer of A through the formation by water injection, and recovering gas and oil from the outlet well.

U.S.P. 2,669,307 (13.6.50; 16.2.54). R. A. Mulholland and B. S. Friedman, assrs to Sinclair Oil and Gas Co. In the process of U.S.P. 2,669,306 the combined drive through the formation is maintained at a linear velocity below 2 ft/day.

U.S.P. 2,669,936 (7.5.52; 23.2.54). L. E. Elkins, R. P. Vincent, and H. Schaefer, assrs to Stanolind Oil and Gas Co. Apparatus for pumping wells.

U.S.P. 2,669,939 (10.7.51; 23.2.54). R. N. Vickers. Deep well pump.

U.S.P. 2,669,940 (24.5.52; 23.2.54). W. S. Crake, assr to Shell Development Co. Sucker rod sand trap for well pumping installation.

U.S.P. 2,670,047 (22.4.49; 23.2.54). G. C. Mayes and R. L. Koch, assrs to Socony-Vacuum Oil Co. Method of initiating combustion in an input well for recovery of petroleum from an output well. A mixture of a granular, refractory surface-active material and petroleum coke is placed in the input well and a combustion supporting gas forced through the input well.

U.S.P. 2,670,056 (12.6.50; 23.2.54). J. A. Rossiter. Separator for removing foreign matter from gas produced from wells. J. M. S.

OILFIELD DEVELOPMENT

1386. World ouput rises. Anon. *Oil Gas J.*, 8.3.54, **52** (44), 76.—World oil production in Dec. 1953 was 11,956,100 b.d., 1·9% higher than in the previous month. Record production was reported from Venezuela and the Middle East.

Tables show crude oil production by countries for Dec. 1953, Nov. 1953, and Dec. 1952. C. A. F.

1387. History and performance of the Coldwater oilfield, Michigan. C. R. Criss and R. L. McCormick. *J. Petrol. Tech.*, Feb. 1954, **6** (2), AIMME Tech. Paper No. 3748, 23–9.—The Coldwater oilfield produces from a dolomite reservoir which is probably both Rogers City and Dundee, at depths of *ca* 3750 ft on an irregular gentle dome. No wells are open in the Dundee, which is believed to have a common oil–water level with the Rogers City. 90 wells have been drilled, 81 being producers, and at the end of 1952 the cumulative production was 12,763,000 brl, and 69 wells were still producing, giving 3600 b.d. oil and 21,000 b.d. water, for there is an effective water drive. The saturation pressure is 1190 p.s.i., and the reservoir has declined from 1453 to 1375 p.s.i. Wells flow until the water cut is 5–10%. The ultimate recovery is placed at 17,500,000 brl. G. D. H.

1388. New Mexico's oil and gas reserves. R. R. Spurrier and W. B. Macey. *Oil Gas J.*, 29.3.54, **52** (47), 91.—Reserves of gas and oil in New Mexico have been substantially increased recently, due to extensions of known fields and the discovery of new ones. Hydrocarbon reserves in the state are tabulated by pools, and proven productive acreages are given. C. A. F.

1389. Where digging is fast and easy. J. A. Kornfeld. *Oil Gas J.*, 8.3.54, **52** (44), 116.—The geology and development of the Lewis Creek field, Logan County, Colorado, is briefly described. The field is a stratigraphical trap producing from the J sand of the Upper Cretaceous Dakota–Graneros group, which pinches out up-dip to the E. Productive depth is *ca* 5400 ft, and the oil column varies from 30 to 42 ft. Permeability averages 1549 mD and porosity 24·2%; water saturation is 23%.

10 wells are producing, and initial production rates range from 200 to 500 b.d. Field output in Dec. 1953 averaged 1585 b.d. C. A. F.

1390. Pembina—a new giant. F. J. Gardner. *Oil Gas J.*, 29.3.54, **52** (47), 165.—Estimated reserves of the Pembina field in west-central Alberta, 65 miles WSW. of Edmonton, now range from 760,000,000 to 952,960,000 brl, indicating it to be Canada's largest field. Production comes from Upper Cretaceous Cardium sand at *ca* 5000 ft, and the field is in the initial stages of development.

The Cardium is between the Belly River and the Viking; it has low porosity and permeability, but responds well to fracture treatment; the crude is 37°. C. A. F.

1391. Plungar well completed. Anon. *Oil Gas J.*, 29.3.54, **52** (47), 80.—2 producers have been completed at Plungar, nr Nottingham, and a third is drilling. Plungar 1 is pumping 3½ tons daily. Further wells are planned. C. A. F.

TRANSPORT AND STORAGE

1392. The chemical tank-cleaning system. Anon. *Mot. Ship*, March 1954, **34** (408), 529.—A comparatively recent development in tank cleaning in the U.K., devised by the Gamlen Chemical Co in the U.S.A. and operated in Britain by Gamlen (London) Ltd, utilizes a strong emulsifying solvent, which, on striking the tank surfaces, has the effect of breaking up the sludge and wax and bringing down the oil adhering to the tank sides. Substantial time-saving is claimed for tank cleaning in all classes of ship. Cost varies according to type of cargo, but averages 9*d.* per ton cargo capacity or 2*s.* 6*d.*/ton for cleaning for a change of cargo. U. M.

1393. How to calculate vapour losses. N. H. Prater. *Petrol. Process.*, 1954, **9** (4), 537–40.—A method is given for estimating the approx evaporation losses from fixed gasoline and other petroleum storage tanks. The most common method of estimating losses is to measure the contents of the tank periodically; this, however, involves a considerable amount of testing, especially if the losses over a whole year are required.

An equation is presented which will enable the tank losses to be quickly estimated approximately; this equation is based on the vaporization and diffusion characteristics of the stored liq. J. W. H.

1394. How pooling can improve pipeline efficiency. P. Reed. *Oil Gas J.*, 10.5.54, **53** (1), 134.—Economics and advantages of pooling of pipeline operation in certain strategic areas are discussed. The pooling of the terminal lines for natural gasoline in the Philadelphia–New Jersey–New York area would be most promising. G. A. C.

1395. Patents. U.S.P. 2,669,248 (7.4.52; 16.2.54). F. L. Miller, assr to Shell Development Co. Reverse flow by-pass valve for pipelines.

U.S.P. 2,669,419 (23.8.50; 16.2.54). F. S. Young, assr to Panhandle Eastern Pipe Line Co. Weld in pipeline valve structure. J. M. S.

Ger.P. 904,291, 31.12.53. Backhaus, Franzen, and Nistler, assrs to Müller Nachfolger Bucher & Co., Güglingen (Württ). Installation for vac degassing, preheating, and storage of liq with double gasification.

BrennstChemie, 1954, **35** (3–4). R. T.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1396. Canada's biggest refinery project. Anon. *Petrol. Process.*, 1954, **9** (3), 364–6.—Imperial Oil Ltd, an affiliate of Standard Oil Co. (N.J.), will replace most of its existing plant with a new refinery with almost double the present capacity at Halifax, N.S. The building programme is estimated to cost between $25 and 30 million. Daily cap of this rebuilt refinery will be 41,625 brl. One of the main features of the expanded refinery will be a 27,000 b.d. fluid unit.

Construction is scheduled to start in early 1955, with completion in the summer of 1956. J. W. H.

1397. Kaskades threaten bubble-caps. Anon. *Chem. Engng*, 1954, **61** (5), 124–8.—The stated advantage is that increased throughput is possible because of higher capacity. A chart comparing dimensions and design loads for an extraction unit is included. D. M.

1398. Short-cut to cooler condenser design. G. H. P. Bras. *Chem. Engng*, 1954, **61** (5), 190–2.—The method outlined is a simplified and improved version of previous methods referred to in earlier articles. A design example is included to indicate the significance of the method. D. M.

1399. Sieve trays. D. C. Lee Jr. *Chem. Engng*, 1954, **61** (5)' 179–82.—Data was developed using a 6½-ft dia column with a single sieve tray operating on the air–water system. A separate pressure drop study was made in 6-inch dia columns. Aeration factors are correlated with liq depth on the tray and are illustrated graphically, together with a weep point correlation. Wide operating ranges are possible at higher plate efficiency than with bubble-cap columns. The method of design is discussed. D. M.

1400. Three new tray designs: Uniflux. Float valve. I. E. Nutter. **Flexibility.** C. E. Thrift. *Chem. Engng*, 1954, **61** (5), 173–8.—Design details, operating characteristics, relative advantages of each tray, and experience to date are dealt with separately for each type. D. M.

1401. Latent cooling of compressors. H. Menard and E. D. Blossom. *Oil Gas J.*, 26.4.54, **52** (51), 231.—The latent cooling of engine jackets with boiling water, thus transferring the engine heat to the water by means of latent heat, is discussed, and savings on costs shown. Tables gives comparisons of operation and factors influencing the costs. G. A. C.

1402. Patents. U.S.P. 2,669,506 (14.10.48; 16.2.54). L. J. Weber, assr to Phillips Petroleum Co. Apparatus for controlling flow of pebbles through a pebble heating apparatus.

U.S.P. 2,670,083 (28.10.49; 23.2.54). D. L. McKay, assr to Phililps Petroleum Co. Improved method of removing filtrate from filter cakes. J. M. S.

Ger.P. 902,501, 10.12.53. — Reich, assr to Leich, Vignati, Wien u. Wieden, Solingen-Ohligs. Device for abstracting pressure gas from containers with liq-gas filling.

Ger.P. 903,329, 17.12.53. — Kaufmann and — Erbe, assrs to Farbwerke Hoechst AG formerly Meister Lucius & Brüning, Frankfurt (M). Hoechst. Installation for heat exchange. (Addn. to Pat. 899,795

BrennstChemie, 1954, **35** (1–2).

Ger.P. 904,173, 31.12.53. — Deussen and — Gubin, assrs to Ruhrchemie AG, Oberhausen-Holten. Installation for continuous filtration of large quantities of liq.

Ger.P. 903,690, 24.12.53. — Fritz and — Gerstner, assrs to Wacker-Chemie G.m.b.H. Heat exchanger for cat conversion and operating procedure.

Ger.P. 904,050, 31.12.53. — Finger, assr to Zimmermann & Jansen G.m.b.H., Düren (Rhld). Heat exchange column for gases, vapours or liq, *e.g.* benzene, ammonia, etc.

BrennstChemie, 1954, **35** (3–4). R. T.

DISTILLATION

1403. Chemical engineering—Pt VI. Distillation. D. C. Freshwater. *Inst. Petrol. Rev.* 1954, **8** (85), 10–13.—The basic theory underlying the dist of binary systems of different types is described. Of course, practical dist in the petroleum industry is concerned not only with binary systems but with systems containing many components. The translation of the theory into practice is described. In practice continuous dist is usually carried out although the batch process is still used. Engineering details of the apparatus used are given, including reference to multi-column dist units. R. H.

1404. Fractionating-absorption tray design. R. M. Young *et al. Oil Gas J.*, 26.4.54, **52** (51), 152.—Design and performance of liq–vapour contacting devices are discussed. They include bubble caps, perforated trays, Ragatz recycling tray, Shell turbogrid, Nutter float-valve bubble trays, Socony-Vacuum Uniflex tray, Gulf perforated tray, and Koch Kascade flowtray. G. A. C.

1405. Dynamics of evaporation of ideal multicomponent liquid mixtures. L. I. Rubinshtein. *Doklady Akad. Nauk S.S.S.R.*, 1953, **90**, 987–90—Mathematical treatment, on assumption that: vapour passes to atmosphere by diffusion alone (no convection), liq phase remains homogeneous, vol of evaporating layer is small by comparison with dimensions of evaporation surface. V. B.

1406. Patents. U.S.P. 2,668,425 (25.8.51; 9.2.54). G. T. Skaperdas, assr to M. W. Kellogg Co. Removing impurities from a gas liquefaction system with aid of an extraneous gas stream.

U.S.P. 2,668,794 (24.5.46; 9.2.54). R. J. Schmidt, assr to U.S.A. (Atomic Energy Commission). Dist system for recovering spent pumping oils.

U.S.P. 2,669,541 (4.11.48; 16.2.54). W. E. Catterall, assr to Standard Oil Development Co. Separating acetone from mixtures by extractive dist with water.

U.S.P. 2,670,319 (14.4.50; 23.2.54). G. W. Ayers, M. J. Geerts, and R. E. Chandler, assrs to Pure Oil Co. *tert*-Butyl hydroperoxide or benzoyl peroxide is added to light petroleum oils to inhibit the increase of mercaptan content which occurs during dist. J. M. S.

Ger.P. 902,005, 3.12.53. Herbert, Eisenlohr, Kohrt, and Jauernik, assrs to Metallges. AG, Frankfurt (M.). Process for recovering solvent by dist from phenolic soln.

Ger.P. 902,368, 3.12.53. Eisenlohr, Grob, Kohrt, and Jauernik, assrs to Metallges. AG, Frankfurt (M). Method for processing phenolic waste waters.

Ger.P. 902,376, 3.12.53. Pilch, assr to BASF Ludwigshafen (Rhein). Process for separating higher-mol alcohols from mixtures with hydrocarbons.

Ger.P. 902,008, 3.12.53. Broich, Schöllig, and Stadelmann, assrs to BASF, Ludwigshafen (Rhein). Process for separating paraffins and mono-olefins.

Ger.P. 903,260, 17.12.53. Siebert, assr to Metallges. AG, Frankfurt (M.). Process for obtaining pure propane and pure butane by continuous dist of C_3–, C_4–, C_5– hydrocarbons and their mixtures.

BrennstChemie, 1954, **35** (1–2).

Ger.P. 903, 445, 24.12.53. Sigwart, assr to Farbenfabr. Bayer AG, Leverkusen-Bayerwerk. Bubble plate for exchange columns.

Ger.P. 903,446, 24.12.53. Sigwart, assr to Farbenfabr. Bayer AG, Leverkusen-Bayerwerk. Bubble plate for exchange columns. (Addn. to Pat. 744,364.)

Ger.P. 903,448, 14.12.53. Gerlach, assr to Uhde G.m.b.H., Dortmund. Process for rectifying mixtures of fluctuating composition.

BrennstChemie, 1954, **35** (3–4). R. T.

ABSORPTION AND ADSORPTION

1407. Patents. U.S.P. 2,668,139 (27.10.49; 2.2.54). J. B. Baird and N. C. Turner, assrs to Hudson Engineering Corpn. Separation of hydrocarbons, free from methane, from natural gas using partial condensation, absorption, and rectification.

U.S.P. 2,670,391 (29.6.51; 23.2.54). A. P. Lien and C. E. Johnson, assrs to Standard Oil Co. Ethylene (A) is recovered from gases containing A, propylene (B), and other constituents by scrubbing the gas with a sulphonic acid to remove B, passing the residual gas into contact with a sulphonic acid containing boron trifluorine (C) to esterify A, removing the ethyl ester from the gas, stripping C from the ester, and heating the ester to 150°–250° C to liberate pure A. J. M. S.

Ger.P. 902,294, 3.12.53. — Buchner, — Fritzsche, and Roelen, assrs to Ruhrchemie AG, Oberhausen-Holten. Process for separating small amounts of alcohols and similar O_2-containing compounds from hydrocarbon mixtures.

Ger.P. 903,210, 17.12.53. — Roelen and — Hansen, assrs to Ruhrchemie AG, Oberhausen-Holten. Process for separating hydrocarbons from their mixtures with high-mol O_2-containing compounds.

BrennstChemie, 1954, **35** (1–2). R. T.

SOLVENT EXTRACTION AND DEWAXING

1408. Patents. U.S.P. 2,668,140 (24.5.50; 2.2.54). K. G. Arabian, assr to Shell Development Co. Crude wax is dissolved in a dewaxing solvent, cooled to 40°–60° F and a high melting, microcrystalline wax (A) recovered. (A) is dissolved in a dewaxing solvent, cooled, and solid wax separated off at a temp not lower than 100° F. This fraction is a high melting hard wax, and from the soln can be recovered a high melting plastic wax.

U.S.P. 2,668,141 (19.11.48; 2.2.54). F. T. E. Palmquist, assr to Akt. Separator-Nobel. In separating wax from oil-solvent by centrifuging, a layer of an auxiliary liq having a sp. gr. intermediate the wax and the oil-solvent phase, and having a surface tension sufficiently low to allow wax, but not the oil-solvent phase, to pass into it, is formed in the centrifuging locus.

U.S.P. 2,668,756 (27.9.48; 9.2.54). S. C. Carney, assr to Phillips Petroleum Co. Liq–liq contacting with centrifuging in the mixing zone.

U.S.P. 2,669,505 (18.12.48; 16.2.54). C. O. Rhys and W. E. Stanton, assrs to Standard Oil Development Co. Contacting plate for liq–liq extraction tower.

U.S.P. 2,670,317 (27.5.49; 23.2.54). G. F. Adams, assr to Universal Oil Products Co. Oil and bitumen are extracted from solid materials containing them by contacting with a liquefied normally gaseous hydrocarbon (A) at about the b.p. of A, separating the liq, heating it under pressure to ppt the bitumen, separating the bitumen, and heating the remaining liq under pressure to the crit. temp. of A to form an oil phase and a separate phase of A and separating these phases.

U.S.P. 2,670,318 (6.1.51; 23.2.54). C. J. Halamka and L. R. La Porte, assrs to California Research Corpn. Waxy lub oil stock is subjected to solvent dewaxing to produce a wax-free oil and a slack wax (A). A is fractionated to produce a number of narrow-boiling wax dist, including a low boiling wax dist (B), which on de-oiling yields a wax having a m.p. between 125° and 140° F. A wax dist of intermediate boiling range is solvent de-oiled to produce an oil-free wax and a foots oil (C). C is solvent dewaxed to produce a lub oil and a slack wax (D). 20–35 vol of D are mixed with 80–65 vol of B and the mixture solvent-de-oiled to produce a low melting wax of superior properties. J. M. S.

CRACKING

1409. Catalysis in petroleum refining. G. Egloff. *Combustibles* (*Zaragoza*), 1953, **13**, 104–16. *Cf.* Abs. **1357**, 1953. A. C.

1410. Improve fluid cat cracker operation. Anon. *Oil Gas J.*, 3.5.54, **52** (52), 86.—2 detailed tests developed by the American Cyanamid Co are presented in full for determination of activity and particle size distribution of fluid cat cracking cat. The results help to cut down on excessive cat loss, correct conditions leading to after-burning, improve product distribution, regenerate cat more evenly, completely, and effectively, and increase gasoline yield. Charts and tables illustrate the article. G. A. C.

1411. Reduce FCC stack losses. C. A. Seibert and D. L. Cleveland. *Oil Gas J.*, 31.5.54, **53** (4), 78.—Preferential withdrawal of cat fines in the fluid cat system reduces stack losses, and it has been shown at Shell Oil Co's Wilmington refinery that such loss of cat is proportional to the concn of 0–2-μ fines in the system. The size–selectivity characteristics of cyclones and electrical precipitators make it possible to segregate and remove fines from the plant without any adverse effect on plant operations. G. A. C.

1412. Cracking unit a source of heat? O. F. Campbell and N. E. Pennels. *Petrol. Process.*, 1954, **9** (3), 352–8.—The production of approx 400,000 lb/hr of 550 p.s.i.g., 750° F total temp steam is a unique feature of Sinclair Refining Co's new 40,000-b.d. fluid cat cracking unit at Houston, Texas, U.S.A. The flue gas is burned in a combination CO boiler, and is then superheated in the regenerator of the cat cracker, by a respray type steam super-heater.

Heat balances are presented for the CO boiler and the superheater. Elevation and plan views are also given of the boiler, together with the arrangement of the steam superheater coils in the regenerator. J. W. H.

1413. The cracking plant in the Bosanski Brod refinery. D. Riffer. *Nafta* (*Yugoslavia*), 1954, **5** (2), 37–46.—Description of the cracking plant erected at the Bosanski Brod refinery by the German firm Friedrich Uhde, Dortmund, now being put into operation. (Author's abstract.)

1414. More on the fluid coking process. H. Z. Martin, F. T. Barr, and R. W. Krebs. *Oil Gas J.*, 10.5.54, **53** (1), 166.—This new coking process, developed at the Esso Laboratories, Linden, N.J., and at Baton Rouge, La., is an adaptation of the fluidized–solids technique to the coking of crude residue and similar low grade oils. The process, which is continuous, produces more gas oil and gasoline with a reduced coke yield, and the coke is fine, uniform, and easily handled. Tables show yields, coke quality, coker operating requirements, and economics. G. A. C.

1415. Patents. U.S.P. 2,658,028 (14.12.51; 3.11.53). V. Haensel and L. Schmerling, assrs to Universal Oil Products Co. Reforming cat prepared by reacting γ-alumina with a carboxylic acid to form a basic aluminium salt, combining with 0·01–1% platinum and heating the composite.

U.S.P. 2,658,822 (17.8.49; 10.11.53). R. J. Hengstebeck, assr to Standard Oil Co. Apparatus for contacting fluids with fluidized solids.

U.S.P. 2,658,856 (27.7.51; 10.11.53). S. F. Perry and R. M. Bailly, assrs to Standard Oil Development Co. High quality waxes are produced by contacting a wax fraction containing $<3\%$ of oil with a cat comprising 5–13 wt % molybdenum oxide on alumina at 400°–700° F under pressure of 0–400 p.s.i. in the presence of 100–500 cu. ft. hydrogen/brl of wax fraction.

U.S.P. 2,658,857 (29.3.51; 10.11.53). J. C. Roediger, assr to Standard Oil Development Co. Bitumen suitable as a saturant for fibre board is made by subjecting the cycle oil from a cat cracking operation to thermal cracking and dist the tar fraction to the desired consistency.

U.S.P. 2,658,858 (22.6.49; 10.11.53). W. H. Lang, W. A. Stover, and C. L. Gutzeit, assrs to Socony-Vacuum Oil Co. Aromatization reforming of hydrocarbon mixtures is effected in the presence of a chromium oxide–iron group metal oxide cat at 450°–650° C, at a pressure between atmospheric and

300 p.s.i.g., and at a liq hourly space velocity between 0·2 and 2·5.

U.S.P. 2,658,859 (5.3.49; 10.11.53). J. C. Dart, assr to Houdry Process Corpn. Cat conversion of hydrocarbons using a hydratable adsorbent contact mass.

U.S.P. 2,658,860 (28.6.46; 10.11.53). A. B. Welty, assr to Standard Oil Development Co. Separation of contaminated cat particles in a hydrocarbon conversion process.

U.S.P. 2,658,875 (Netherlands 27.3.50; 10.11.53). G. C. A. Schmit and J. J. B. van Eijk van Voorthuysen, assrs to Shell Development Co. Nickel cat is produced by precipitating nickel hydroxide and hydrous silica, treating the precipitate with water under pressure at a temp above 100° C until at least half of the nickel is converted to nickel montmorillonite (A) and reducing the product at at least 425° C until at least half but not all of A is reduced to metallic nickel.

U.S.P. 2,658,931 (12.6.52; 10.11.53). L. C. Drake and R. L. Smith, assrs to Socony-Vacuum Oil Co. Reforming cat is made by thermal decomposition of an alkali metal chromicyanide in an oxygen-free atmosphere and extracting the product with water until free from soluble matter.

U.S.P. 2,659,692 (26.2.49; 17.11.53). V. Haensel and C. G. Gerhold, assrs to Universal Oil Products Co. Reforming process comprising dist a hydrocarbon fraction containing naphthenes into a higher (A) and lower (B) boiling fraction and reforming A and B separately in the presence of hydrogen and a cat comprising platinum and alumina. The reforming of A is carried out under less intense conditions than the reforming of B, and the cat for reforming B contains a higher concn of halogen promoter.

U.S.P. 2,659,701 (29.6.51; 17.11.53). L. Heard and M. J. Den Herder, assrs to Standard Oil Co. Reforming cat made by mixing a platinum compound with a soln of a sulphide of a nitrogen base, mixing the resultant stable soln of platinum sulphide with alumina, and drying and calcining the mixture.

U.S.P. 2,660,520 (28.5.51; 24.11.53). S. R. Bethea, assr to Standard Oil Development Co. Apparatus for converting hydrocarbons by contact with a liq phosphoric acid cat.

U.S.P. 2,660,552 (30.9.50; 24.11.53). F. H. Blanding, assr to Standard Oil Development Co. High V.I. lub oil is obtained by cat cracking a gas oil feed stock boiling in the range 650°–1100° F, fractionating a fraction from the cracked products boiling in the range 700°–1100° F, removing aromatics by solvent extraction and dewaxing.

U.S.P. 2,660,553 (23.2.51; 24.11.53). W. T. Knox, assr to Standard Oil Development Co. Same process as U.S.P. 2,660,552 directed to the production of the wax.

U.S.P. 2,668,101 (21.1.49; 2.2.54). M. R. Arnold and H. M. Baugh, assrs to National Cylinder Gas Co. In the production of hydrogen and carbon oxides by passing a hydrocarbon with oxygen over a reforming cat at 1200°–2000° F, the deposition of carbon on the cat is inhibited by raising the temp of the reactant gases to the reforming temp prior to contact with the cat by passing them over a heated mass of alumina which is free from iron and nickel.

U.S.P. 2,668,142 (6.2.52; 2.2.54). H. A. Strecker and H. M. Stine, assrs to Standard Oil Co. Reforming cat containing 10–30 mol % chromia, 50–90 mol % alumina, 1–30 mol % antimony oxide, and 0·1–5·0 mol % of an oxide of gallium, cadmium, thorium, zirconium, or iridium.

U.S.P. 2,668,755 (23.11.48; 9.2.54). H. Kershaw and E. D. Dowling, assrs to M. W. Kellogg Co. Plug-type control valve for fluidized cat conversion systems.

U.S.P. 2,668,791–2 (16.10.48, 1.11.48; 9.2.54). W. W. Holland, assr to Gyro Process Co. Control of gas production in cracking of liq hydrocarbons.

U.S.P. 2,668,793 (23.10.48; 9.2.54). W. W. Holland, assr to Gyro Process Co. Furnace for cracking hydrocarbons at constant temp.

U.S.P. 2,668,798 (28.12.51; 9.2.54). C. J. Plank, assr to Socony-Vacuum Oil Co. Siliceous cracking cat contaminated with nickel is reactivated by contacting with dil mineral acid soln, washing free from excess acid, and subjecting to steam at 1000°–1300° F for 2–48 hr.

U.S.P. 2,669,540 (29.4.50; 16.2.54). W. W. Weinrich, assr to Houdry Process Corpn. Method of depositing disengaged particles from a disengaging zone on to a bed of the particles.

U.S.P. 2,669,591 (31.12.48; 16.2.54). H. J. Hepp, assr to Phillips Petroleum Co. Conversion of hydrocarbons with hot combustion gases and finely divided cat.

U.S.P. 2,670,320 (30.6.50; 23.2.54). L. S. Kassel, assr to Universal Oil Products Co. Motor fuels are produced by cracking heavier oils in the presence of a cat comprising hydrogen fluoride, recovering hydrocarbons boiling in the gasoline range, reforming these under conditions that result in a net production of hydrogen and treating the used cat with some of this hydrogen to regenerate the cat.

U.S.P. 2,670,321 (3.3.49; 23.2.54). J. C. Morrell. Cracking cat comprising a mixture of silica, titanium oxide, and an oxide of chromium, molybdenum, or vanadium in gel form.

U.S.P. 2,670,322 (1.5.51; 23.2.54). R. W. Krebs and A. Voorhies, assrs to Standard Oil Development Co. Naphtha is reformed by pretreating it with olefinic cracked gases in contact with a hydrogen transfer cat under hydrogen transfer conditions, passing the treated naphtha with finely divided hot inert contact solids into a coking zone, where the solids are maintained in a dense fluidized bed, spraying a residuum into the coking zone above the bed, and converting the residuum to volatile products and coke, recovering olefinic cracked gases from the vaporous products and recycling them to the pretreatment step. J. M. S.

Ger.P. 902,493, 10.12.53. — Hagemann, assr to Ruhrchemie AG, Oberhausen-Holten. Process for cracking esters in products of cat hydrogenation.

Ger.P. 902,769, 10.12.53. — Klein, assr to BASF Ludwigshafen (Rhein). Process for cracking hydrocarbons.

BrennstChemie, 1954, **38** (1–2). R. T.

HYDROGENATION

1416. The use of hydrogenation in German fuel production. M. Pier. *Kiv. Combust.*, 1954, **8** (1), 5–14.—The development of the German hydrogenation industry for the production of liq fuels from coal, lignite, and heavy mineral oils is examined, from the first commercial plant at Leuna (1927) to the recent situation. The application of the existing hydrogenation plants in W. Germany to the refining of domestic and imported crudes is discussed. Particular reference is made to the combination of hydrogenation and modern cracking processes, at present adopted by several German refining plants. More recent technical achievements in the application of the hydrogenation process to the refining of high sulphur crude oils are mentioned. (Author's summary.)

1417. Catalyst for analytical hydrogenation and dehydrogenation of hydrocarbons. I. A. Musaev and G. D. Gal'pern. *Doklady Akad. Nauk S.S.S.R.*, 1953, **88**, 71–2.—Charcoal soaked overnight in mixed aq soln of chloroplatinic acid and ferric chloride, mixture evaporated to dryness, charcoal reduced with H_2 at temp progressively increasing 150°–330° C, till HCl evolution ceases (6–8 hr). Cat is suitable for analysis of S.R. gasoline and kerosine, since *cyclo*hexane and derivatives are dehydrogenated to benzene and naphthalene hydrocarbons, whilst almost no breakdown of penta-methylene compounds occurs. V. B.

1418. Patents. U.S.P. 2,658,861 (19.11.48; 10.11.53). E. F. Pevere, H. V. Hess, and G. B. Arnold, assrs to Texas Co. Hydrogenation of coal is carried out by mixing the coal, having an average dia $< \frac{1}{4}$-inch, with a hydro-aromatic oil at 550°–850° F and above the plastic point of the coal, to form a homogeneous liq mixture, contacting the mixture with

hydrogen at 600°–900° F and at a pressure of 1000–10,000 p.s.i.g. to hydrogenate the liq and form a particulate solid residue, maintaining a fluidized bed of the solid residue, and discharging the liq and solids from the hydrogenation zone.
J. M. S.

Ger.P. 902,006, 3.12.53. Heckel and Poelen, assrs to Ruhrchemie AG, Oberhausen-Holten. Process for cat hydrogenation of CO.

Ger.P. 902,851, 10.12.53. Heckel, Martin, and Roelen, assrs to Ruhrchemie AG, Oberhausen-Holten. Iron cat for obtaining chiefly olefinic and O_3-containing products in CO hydrogenation.
BrennstChemie, 1954, **35** (1–2).

Ger.P. 904,891, 7.1.54. Rettig, assr to Ruhrchemie AG, Oberhausen-Holten. Process for cat CO hydrogenation.

Ger.P. 904,678,7.1.54. Stöwener and Becke, assrs to BASF. Process for cracking hydrocarbons or for pressure hydrogenation of coals, tars, or mineral oils. (Addn. to Pat. 874,247.)
BrennstChemie, 1954, **35** (3–4). R. T.

POLYMERIZATION

1419. Action of charcoal and alumino-silicate on polymerization of olefins by gaseous boron fluoride. Ya. M. Paushkin and L. I. Scherbakov. *Doklady Akad. Nauk S.S.S.R.*, 1953, **90**, 795–7.—Al silicate absorbed 15%, charcoal 19%, of BF_3 at 20° C. Polymerization experiments with *iso*- and *n*-butylene and *iso*-amylene at 25°–35° C. Carriers alone caused no polymerization at this temp or at 100° C. Cat effect of BF_3 varies with carrier, *n*-butylene polymerized by BF_3 on Al silicate but not on charcoal, although this cat polymerizes *iso*butylene and *iso*amylene more effectively than does BF_3 on Al silicate. Mechanism of cat activation discussed.
V. B.

1420. Patents. U.S.P. 2,658,059 (27.4.50; 3.11.53). E. F. Peters and B. L. Evering, assrs to Standard Oil Co. Vapour phase polymerization of ethylene in presence of a cat comprising nickel and/or cobalt on an activated carbon support.

U.S.P. 2,658,902 (3.5.47; 10.11.53). G. C. Johnson, assr to Socony-Vacuum Oil Co. Thiophene or a monoalkyl thiophene is polymerized by contacting with a silica–alumina cat at 20°–200° C.

U.S.P. 2,658,933 (17.6.51; 10.11.53). W. G. May and G. L. Matheson, assrs to Standard Oil Development Co. In the polymerization of olefins in which a solid finely divided phosphoric acid cat is maintained as an agitated suspension in a fluid hydrocarbon phase and in which some of the cat agglomerates owing to the adsorption thereon of high mol. wt. materials, the agglomerated cat is removed from the suspension, washed with a solvent for the high mol. wt. materials, and returned to the suspension.

U.S.P. 2,660,572 (11.2.50; 24.11.53). C. F. Feasley, assr to Socony-Vacuum Oil Co. Polymeric material of low p.f. is made by heating an aromatic pet stock boiling in the range 360°–560° F with formaldehyde and an acid activated Montmorillonite clay at *ca* 250° F for *ca* 45 minutes, separating the liq portion of the reaction product, heating this liq with activated Montmorillonite clay at *ca* 180° F, again separating the liq and dist under reduced pressure to leave a polymeric residue having a visc at 210° F of *ca* 836 cs, a R. & B. point of *ca* 132° F, and a p.f. at 60° C of 0·07% loss and at 100° C of 0·40% loss.

U.S.P. 2,668,163 (15.8.49; 2.2.54). W. B. Reynolds, J. E. Wicklatz, and T. J. Kennedy, assrs to Phillips Petroleum Co. A hydroperoxide produced by oxidizing 5-(4-*iso*propylphenyl)-2-pentene with free oxygen is used as oxidizing constituent of a polymerization cat in the emulsion polymerization of conjugated diolefins.

U.S.P. 2,669,531 (22.12.47; 16.2.54). A. G. Petkins, assr to Universal Oil Products Co. Polymerization cat is removed from a confined zone by passing steam through it to distil hydrocarbonaceous materials therefrom and effect partial softening of the cat, and then forcing the cat downwards out of the zone by applying hydraulic pressure to the top of the cat bed.

U.S.P. 2,670,392 (19.4.50; 23.2.54). W. F. Glassmire and J. H. Phillips, assrs to Texas Co. Olefin polymers boiling within the gasoline boiling range are polymerized further by contacting with strong sulphuric acid at below 70° F in the presence of an *iso*paraffin lower boiling than the charge.

U.S.P. 2,670,393 (10.1.52; 23.2.54). M. T. Howerton, assr to University of Notre Dame Du Lac. *iso*Butene (A) is polymerized by contacting it in the vapour phase with anhyd sulphur trioxide (B) in the proportion 0·01–0·05 mol B per mol A.
J. M. S.

Ger.P. 902,369, 3.12.53. Ruhrchemie AG, Oberhausen-Holten. Method for producing high-mol hydrocarbons.
BrennstChemie, 1954, **35** (1–2). R. T.

ALKYLATION

1421. Alkylation of benzene, xylene, and butylbenzene by acetylene. V. L. Vaiser. *Doklady Akad. Nauk S.S.S.R.*, 1953, **91**, 535–8.—Results of alkylation experiments at 20°–115° C with C_6H_6, *o*- and *m*-xylene, and butylbenzene. Cat used was phosphoric acid saturated with BF_3 and containing (except in case of butylbenzene) a small quantity of HgO. Identified products are ethylidenediphenyl, ethylidinedixylyl, and ethylidenebutylbenzene; also solid polymers of uncertain composition.
V. B.

1422. *Cyclo*alkylation of *iso*butane and *iso*pentane with *cyclo*hexene with formation of alkylnaphthenes. Ya. M. Paushkin and A. K. Zhomov. *Doklady Akad. Nauk S.S.S.R.*, 1953, **90**, 1047–9.—Using H_3PO_4·BF_3 cat at −15° C, *iso*butane and *iso*pentane were alkylated by *cyclo*hexene with respective yields of *iso*butyl*cyclo*hexane and *iso*amyl*cyclo*hexane of 20 and 36%. $AlCl_3$ and H_2SO_4 were ineffective as cat.
V. B.

1423. Electrical conductivity as a catalyst characteristic in the reactions of polymerization and alkylation with boron fluoride compounds. Ya. M. Paushkin and M. V. Kurashev. *Doklady Akad. Nauk S.S.S.R.*, 1953, **88**, 995–8.—Cat used was H_3PO_4·BF_3, which was emulsified in heptane, tests at 20°–25° C on polymerization of propylene and *iso*butylene and alkylation of benzene with propylene. Cat conductivity falls parallel to decrease of d; whilst there is no general relationship, for different cat, between conductivity and activity, a linear relationship holds for any given cat. Change in cat is more gradual with alkylation than with polymerization.
V. B.

1424. Electrical conductivity as a catalyst characteristic in the reactions of alkylation and polymerization with sulphuric acid. Ya. M. Paushkin and M. V. Kurashev. *Doklady Akad. Nauk S.S.S.R.*, 1953, **89**, 69–72.—Tests similar to those previously done (see preceding abstract) except that alkylation was of *iso*pentane by *iso*butylene. Previous findings confirmed for H_2SO_4.
V. B.

1425. Patents. U.S.P. 2,658,872 (5.3.49; 10.11.53). W. C. Hollyday and M. H. Mahan, assrs to Standard Oil Development Co. A copolymer of an aryl substituted mono-olefin and an alkene of 3–5 carbon atoms is alkylated with octadecene.

U.S.P. 2,658,901 (19.3.48; 10.11.53). G. C. Johnson, assr to Socony-Vacuum Oil Co. Alkylatable thiophenes are reacted with terpenes in the presence of 85% phosphoric acid.

U.S.P. 2,660,610 (24.2.51; 24.11.53). M. Erchak, assr to Allied Chemical and Dye Corpn. Alkylbenzenes are made by reacting certain alkylbenzenes with ethylene in a mol ratio of at least 0·5 : 1 at 200°–350° C and at a pressure of 500–5000 p.s.i. in the presence of a peroxy cat. The starting alkylbenzene has not more than 2 substituents, and the substituent alkyl groups contain not more than 10 carbon atoms each, and there is at least one hydrogen atom attached to a saturated carbon atom alpha to the benzene ring.

U.S.P. 2,668,865 (28.2.50; 9.2.54). A. Schneider, assr to Sun Oil Co. Polyalkyl*cyclo*hexanes are made by reacting in the liq phase an alkyl substituted *cyclo*pentane with an *iso*-paraffin having 4–6 carbon atoms and at least one tertiary hydrogen atom in contact with hydrogen fluoride and an olefin.

U.S.P. 2,670,390 (25.7.51; 23.2.54). H. Pines and V. N. Ipatieff, assrs to Universal Oil Products Co. Side chain alkylation of aromatic hydrocarbons effected in the presence of an alkali metal and an acetylenic hydrocarbon. J. M. S.

ISOMERIZATION

1426. Patents. U.S.P. 2,668,790 (12.1.53; 9.2.54). G. M. Good, J. W. Gibson, and B. S. Greensfelder, assrs to Shell Development Co. Lub oils are made from paraffin wax by contacting the wax in the liq phase and at least 1 mol H_2 per mol of wax with a supported platinum cat at 300°–500° C and 50–3000 p.s.i.g. for a contact time of at least 5 minutes, but insufficient to produce more than 25% conversion to cracked products, cooling, separating, and recycling the gas, dist the product to remove a lub oil, and subjecting the lub oil to a dewaxing treatment.

U.S.P. 2,668,866 (14.8.51; 9.2.54). G. M. Good, J. W. Gibson, and B. S. Greensfelder, assrs to Shell Development Co. Paraffin wax is isomerized by contacting it in the vapour phase with at least 1 mol H_2 per mol of wax with a supported platinum cat at 300°–500° C. J. M. S.

CHEMICAL AND PHYSICAL REFINING

1427. Simultaneous extraction of benzene and toluene by the sulphur dioxide process. R. A. Ratliff and W. B. Strobel. *Oil Gas J.*, 31.5.54, **53** (4), 87.—The process employed by the Continental Oil Co in the Lake Charles, La., refinery is a sulphur dioxide solvent extraction modified for utilization of a hydrocarbon wash oil to effect of 98–99% purity. Only one stage of separation is required to remove SO_2, and methanol is utilized for the azeotropic separation of non-aromatics from benzene.

A flow sheet is given. G. A. C.

1428. Sulphur recovery from H_2S. H. L. Hays and F. T. Barber. *Oil Gas J.*, 26.4.54, **52** (51), 218.—The modified Claus sulphur-recovery process is discussed, and it is shown that close control must be maintained to ensure optimum and trouble-free operation. Composition and quantity of feed gas are major factors affecting profitability. G. A. C.

1429. Dualayer gasoline treating process. G. A. Duval and V. A. Kalichevsky. *Petrol. Refin.*, 1954, **33** (4), 161–3.—Investigation of caustic soln containing organic acids has shown that at certain concn 2 immiscible layers are formed which are also immiscible with oil. By using such mixtures the extraction of mercaptans from gasoline is much higher than with conventional solutizer treatment. The system discussed here is potassium hydroxide, water, and cresylic acid. A doctor sweet product is obtained from a 2-stage contactor using less than 10% of the conventional vol of soln. Regeneration is effected by dilution with water followed by closed steam stripping. Water content of the treating soln is controlled by the stripper temp and the potassium hydroxide content by equilibrium with a potassium hydroxide–water layer in an equilibrium drum. The process can be extended to heavier dist such as kerosine or dist fuel oils. R. D. S.

1430. H_2S removal for $76 per million feet. R. A. Feagan, H. L. Lawler, and M. H. Rahmes. *Oil Gas J.*, 26.4.54, **52** (51), 280.—Experiences with 5 units employing mono-ethanol-amine–water soln for removal of H_2S and CO_2 are discussed. Recommendations for designer and operator are made. G. A. C.

1431. Patents. U.S.P. 2,669,538 (18.2.49; 16.2.54). F. H. Yurasko and H. C. North, assrs to Standard Oil Development Co. Gases are separated from viscous liq, *e.g.* bitumen, by heating the liq, passing it through a vapour space at a high velocity, and impinging it on to a resilient mass of filamentous material.

U.S.P. 2,669,539 (21.12.50; 16.2.54). J. G. Ditman, assr to Foster Wheeler Corpn. Propane de-asphalting of crude residual oils.

U.S.P. 2,670,343 (12.3.48; 23.2.54). L. C. Fetterly, assr to Shell Development Co. Straight chain hydrocarbons (A) are separated from their mixtures with non-straight chain hydrocarbons (B) by contacting the mixture with an aq soln of urea at a temp below 75° C to form a solid phase of A-urea complexes, a dilute aq urea phase (C) and a B phase, separating these phases, mixing the solid complex with C, heating to 45°–90° C to decompose the complex, separating A, and recycling the urea soln to treat the original mixture.

U.S.P. 2,670,344 (18.12.50; 23.2.54). L. C. Fetterly, assr to Shell Development Co. *cyclo*Hexane is separated from its mixtures with other hydrocarbons by contacting the vaporized mixture with thiourea and heating the *cyclo*hexane–thiourea complex formed. J. M. S.

Ger.P. 903,331, 17.12.53. Schröder, Wiesbaden. Process for separating resin-forming materials and other impurities from hydrocarbon oils.
BrennstChemie, 1954, **35** (1–2).

Ger.P. 904,579, 7.1.54. Schaub, Sexauer, and Bär, assrs to Ruhrchemie AG, Oberhausen-Holten & Gastech. G.m.b.H., Oberhausen. Process for desulphurizing gases.

Ger.P. 904,580, 7.1.54. Appelt, Schmitt, and Leithe, assrs to Dr C. Otto & Comp. G.m.b.H., Bochum. Process for scrubbing H_2S from coal dist gases (Addn. to Pat. 891,128).
BrennstChemie, 1954, **35** (3–4). R. T.

SPECIAL PROCESSES

1432. Twist a problem into a profit. C. A. Duval and V. A. Kalichevsky. *Petrol. Process.*, 1954, **9** (5), 691–3.—A new gasoline treating process, known as the "Dualayer" process, has been developed by the Magnolia Petroleum Co, Texas, U.S.A., for the highest possible extraction of mercaptans. The principles on which this new process is based are applicable to a large number of systems involving alkali hydroxides, water, and organic substances. Use of the process is not limited to gasoline, it can be applied to the refining of heavier petroleum dist, such as kerosine and dist fuel oils. J. W. H.

1433. New process for separation of isomeric hydrocarbons. P. W. Sherwood. *Chim. et Industr.*, 1954, **71**, 81–4.—*Cf.* Abs. **2025**, 1953.

1434. Some new carbonization processes under development and their relation to established practice. D. T. Barritt and T. Kennaway. *J. Inst. Fuel*, May 1954, **27** (160), 229.—The history of modern coking practice is traced, and it shown how each improvement in method and design has widened the range of coals carbonized. The present position is reviewed, and the limitations of coke ovens are defined with regard to operational characteristics and the narrow range of coals which can be carbonized in them. Details are given of processes under development and the relationship of their scope to existing practice. The processes described are: (1) National Fuels process; (2) Brennstoff-Technik process; and (3) Baumco process. 11 literature refs. D. K.

1435. Realize a profit from refinery coke. E. L. Jones, F. D. Parker, and W. H. Strobel. *Oil Gas J.*, 3.5.54, **52** (52), 97.—The article deals with increased refining profits due to coking, gives a description of the acetylene process, and names the advantages of making acetylene and petrochemicals from coke. G. A. C.

1436. Patents. U.S.P. 2,668,173 (11.3.50; 2.2.54). C. N. Zellner and F. Lister, assrs to Tide Water Associated Oil Co. Method of separating polybasic acidic substances from oxidized hydrocarbons.

U.S.P. 2,668,181 (2.12.49; 2.2.54). F. W. Banes, W. P. FitzGerald, and J. F. Nelson, assrs to Standard Oil Development Co. Normally gaseous mono-olefins are reacted with aliphatic or *cyclo*aliphatic primary or secondary alcohols in the presence of di-*tert*-butyl peroxide or hydroperoxide at 100°–250° C for 1–5 hr at a pressure of 250–1500 p.s.i.g. to form alcohols of higher mol. wt.

U.S.P. 2,668,752 (9.11.49; 9.2.54). H. O. Folkins and E. Miller, assrs to Food Machinery and Chemical Corpn. Carbon disulphide is made by contacting sulphur vapour and hydrocarbon gas with zirconia gel at 550°–700° C.

U.S.P. 2,668,754 (23.2.50; 9.2.54). M. F. Lichtenfels, assr to Columbian Carbon Co. Recovery of carbon black from a gaseous suspension thereof using a spray of aq slurry of carbon black.

U.S.P. 2,668,863 (11.1.52; 9.2.54). W. R. Norris, assr to Standard Oil Development Co. C_3–C_4 alcohols are obtained by the hydration of the corresponding olefins, dist the aq alcohol, treating with sodium or potassium hydroxide and adding glacial acetic acid to neutralize the alkali left in the alcohol.

U.S.P. 2,669,509 (16.9.48; 16.2.54). F. B. Sellers, assr to Texaco Development Corpn. Production of CO and H_2 by reaction of a solid carbonaceous fuel with steam and pure oxygen in a closed reaction zone.

U.S.P. 2,669,586 (7.12.50; 16.2.54). W. R. Middleton, assr to Socony-Vacuum Oil Co. Cat for oxidn processes consisting of an oxide of tellurium and an oxide of a metal of Group VI having an at. wt. of at least 96.

U.S.P. 2,669,587 (19.6.37; 16.2.54). G. E. Miller, E. M. Faber, and H. M. Reeves, assrs to U.S.A. (Secretary of War). Bis-(β-chloroethyl) sulphide is made by reacting ethylene and sulphur dichloride at 40–75 p.s.i.

U.S.P. 2,669,589 (30.12.48; 16.2.54). W. E. Catterall and S. C. Lane, assrs to Standard Oil Development Co. The OXO process carried out in the presence of a non-olefinic hydrocarbon diluent.

U.S.P. 2,670,333 (G.B. 12.4.51; 23.2.54). N. H. Ray, assr to I.C.I. High mol. wt. branched chain hydrocarbons are made by condensing diazomethane and a higher diazoalkane in the presence of an ester of boric acid.

U.S.P. 2,670,364 (30.10.48; 23.2.54). C. E. Hemminger, assr to Standard Oil Development Co. Regeneration of iron cat used in the Fischer–Tropsch process for the production of hydrocarbons of high cetane value.

U.S.P. 2,670,365 (5.3.49; 23.2.54). R. N. Watts and C. F. Gray, assrs to Standard Oil Development Co. Cat for the Fischer–Tropsch process is made by impregnating an Alundum carrier consisting of 85% alumina and 12% silica with an iron salt to give a product containing 5–15% iron and then incorporating an alkali metal compound.

U.S.P. 2,670,366 (27.8.51; 23.2.54). D. G. Cain, C. S. Goddin, and N. M. Caruthers, assrs to Stanolind Oil and Gas Co. Carboxylic acids are recovered from synthesis oil by converting them to their alkali metal salts, separating the aq salt soln, stripping off volatile organic components, and extracting the residue with liq CO_2 at 555–1055 p.s.i.g.

U.S.P. 2,670,378 (12.3.51; 23.2.54). C. G. Frye, assr to Stanolind Oil and Gas Co. In the Fischer–Tropsch process, a carbonyl compound or alcohol is introduced into the reaction zone at a point above the lower ¼ of the zone and is thereby converted to an alcohol or a carbonyl compound respectively simultaneously with the production of hydrocarbons.

U.S.P. 2,670,379 (G.B. 25.3.49; 23.2.54). D. J. Hadley and R. J. Nichol, assrs to Distillers Co. Unsaturated aldehydes are made by reacting an olefin of the formula $R(CH_3)C{:}CHR'$, where R and R′ are hydrogen or an alkyl group, in the vapour phase with oxygen in the presence of selenium and copper silicate.

U.S.P. 2,670,380 (G.B. 8.4.49; 23.2.54). D. J. Hadley, assr to Distillers Co. Unsaturated aldehydes are made by reacting an olefin of the formula $R(CH_3)C{:}CH_2$, where R is hydrogen or an alkyl group, with oxygen at 180°–400° C in the presence of selenium and copper molybdate, chromate, sulphate, tungstate, or vanadate.

U.S.P. 2,670,381 (G.B. 23.7.48; 23.2.54). D. J. Hadley, R. Heap, and R. J. Nichol, assrs to Distillers Co. Acrolein and methacrolein are made by reacting propylene and *iso*butene respectively with oxygen at 210°–400° C in the presence of selenium and copper aluminate.

U.S.P. 2,670,385 (16.6.50; 23.2.54). P. W. Rosenthal and E. A. Naragon, assrs to Texas Co. Alcohols are made by reacting an olefin with CO and H_2 at 250°–350° F and 300–5000 p.s.i.g. in the presence of a cat comprising nickel halide and a carbonyl of a metal of the iron group.

U.S.P. 2,670,386 (18.8.49; 23.2.54). M. Erchak, F. Porter, and C. F. Silsby, assrs to Allied Chemical and Dye Corpn. Alcohols are made by reacting ethylene with a saturated monohydric alcohol containing not more than 8 carbon atoms in the presence of a free radical forming cat at 200°–300° C and 1000–7500 p.s.i. and recovering the products by lowering the pressure below 500 p.s.i. and lowering the temp in not more than 5 minutes to below 100° C.

U.S.P. 2,670,389 (23.11.51; 23.2.54). H. J. Passino, W. O. Teeters, and R. M. Mantell, assrs to M. W. Kellogg Co. Halocarbons are made by reacting fluorine, a halogen other than fluorine, and carbon, in the presence of a metal halide.

J. M. S.

Ger.P. 902,007, 3.12.53. — Gemassmer, assr to Chemische Verwertungsges. Oberhausen m.b.H., Oberhausen-Holten. Method for producing O_2-containing compounds.

Ger.P. 902,733, 10.12.53. — Kolling, — Geiser, and — Puschhoff, assrs to Ruhrchemie AG, Oberhausen-Holten. Method for producing alkylmonochlorides by continuous hydrocarbon chlorination.

Ger.P. 902,495, 10.12.53. — Reppe and — Friederich, assrs, to BASF, Ludwigshafen (Rhein). Method for producing O_2-containing org compounds.

Ger.P. 903,091, 17.12.53. — Kaess and — Doehlemann assrs to Süddeutsche Kalkstickstoff-Werke AG, Trostberg. Method for producing cyanamide salts from calcium cyanamide.

Ger.P. 902,974, 17.12.53. — Seiderl and — Kaffer, assrs to Ges. für Teerverwertung m.b.H., Duisburg-Meiderich. Method for producing coumarone resins. (Addn. to Pat. 899,356.)

BrennstChemie, 1954, **35** (1–2).

Ger. P. 903,573, 24.12.53. — Krekeler and — Leutner, assrs to BASF, Ludwigshafen (Rhein). Method for producing aliphatic dichloro hydrocarbons.

Ger.P. 904,046, 31.12.53. — Rottig, assr to Ruhrchemie AG, Oberhausen. Method for producing nitro hydrocarbons.

Ger.P. 903,931, 31.12.53. — Dengel, assr to Knoll AG, Chemische Fabriken, Ludwigshafen (Rhein). Method for producing nitriles of aliphatic-aromatic hydrocarbons. (Addn. to Pat. 896,344.)

Ger.P. 904,892, 7.1.54. — Metzger, assr to Zschimmer & Schwarz, formerly Chemnitz, Brilon. Method for producing polyoxides.

BrennstChemie, 1954, **35** (3–4). R. T.

METERING AND CONTROL

1437. Petroleum's first all-electric control panel with miniaturized controllers. P. W. Mason. *Fluid Handl.*, Apr. 1954, 86–91.—A description of the general lay-out of the equipment, with detailed accounts and diagrams of specialized sections of the system. D. M.

1438. Instrumenting the fractionation section. T. C. Reidel. *Oil Gas J.*, 26.4.54, **52** (51), 136.—The article deals with instrumentation of fractionating columns, control of gasoline stabilizer, depropanizer–debutanizer system, and natural gasoline fractionation section. An example of complete column control is given; most of the article is in the question–answer style. G. A. C.

1439. Patents. U.S.P. 2,658,522 (19.5.47; 10.11.53). C. J. Coberly, assr to Dresser Equipment Co. Flow metering device.

U.S.P. 2,668,365 (31.12.49; 9.2.54). D. R. Hogin, assr to Standard Oil Development Co. Apparatus for measuring densities of finely divided solid materials fluidized and suspended in a gaseous medium.

U.S.P. 2,669,877 (30.11.48; 23.2.54). H. F. Dunlop and H. J. Ramser, assrs to Atlantic Refining Co. Pressure measuring device embodying a crystal oscillator.

U.S.P. 2,670,193 (9.5.49; 23.2.54). R. Pyzel, assr to M. W. Kellogg Co. Method of controlling flow of fluidized solids.

U.S.P. 2,670,278 (20.4.50; 23.2.54). A. S. King and W. J. Cross, assrs to Houdry Process Corpn. Apparatus for controlling the depth of a bed of granular contact material gravitating through a contact zone in a hydrocarbon conversion system. J. M. S.

PRODUCTS

CHEMISTRY AND PHYSICS

1440. Importance of the study of relations between chemical structure and physical properties in petroleum sulphur. A. Girelli. *Rev. Combust.*, 1954, **8** (1), 15–24.—Correlations between chemical structure and physical properties for different series of petroleum sulphur compounds have been studied. B.p. and f.p. density, visc, refraction index, specific refraction, and refractivity intercept have been plotted against number of carbon atoms of different series of sulphur compounds. More numerous and accurate data on physical properties of such compounds will allow a more complete and satisfactory approach to the establishment of chemical structure–physical properties relationships. (Author's summary.)

1441. Aniline point. E. Bonauguri. *Riv. Combust.*, 1953, **7** (11), 694–733.—Miscibility curves at different temperatures of some ternary systems, including a paraffin, a naphthene, and aniline, have been experimentally determined. Correlations between the critical solution temp of the systems, including *cyclo*pentane, *cyclo*hexane, methyl*cyclo*pentane, methyl*cyclo*hexane, with *n*-heptane and aniline, and mixture composition, have been examined. A proposed equation enables one to determine the amounts of naphthene present by means of graphical interpolation of critical solution temp. The equation proposed could be the beginning for establishing rational correlations as a substitute for empirical formulas, based on aniline point, whose validity is very limited. (Author's summary.)

1442. The composition of mineral oil. H. I. Waterman. *Riv. Combust.*, 1953, **7** (10), 627–48.—Graphic statistic methods for structural group analysis of mineral oils, developed by the author and his school are exposed. Particular reference is made to the "*n–d–M* method," which gives the composition of heavy oils in terms of carbon distribution (percentage carbon in paraffinic, naphthenic, and aromatic structures) and ring content (average number of aromatic and naphthenic rings per molecule). The possible development of a new method including viscosity among the fundamental physical constants to be determined (n–d–η method) is outlined. Some applications of the graphic statistic methods to industrial problems are exposed. (Author's summary.)

1443. Chemical nature of high-molecular petroleum hydrocarbons. S. R. Sergienko and A. A. Mikhnovskaya. *Doklady Akad. Nauk S.S.S.R.*, 1953, **91**, 103–6.—Fractions b.p. > 200° C from Romashkin (Devonian) crude. Kerosine (vac dist), 200°–325° C, (d_4^{20} 0·834, I.V. 19, mol. wt. 215, S 0·8%); pale oil (0·903, 29, 453, 2·3); dark oil (0·957, 56, 480, 3·5) (last 2 fractions obtained by adsorption on silica gel) and fraction 200°–370° C (obtained by cat cracking of pale oil) (0·894, 46, 222, 0·9). Analysis (adsorption coupled with n, *cf.* Abs. **211**, 1951) for naphthene-paraffins, mono-cyclic aromatics, bi-cyclic aromatics, tri-cyclic aromatics, resins, gave: 75, 11, 10, nil, 0·8; 46 (13% solid), 19, 28, nil, 0·8; 1, 6, 76, nil, 17 (mol. wt. 780); 49, 14, 17, 17, nil; respectively. Presence of polycyclic aromatics in cracked product confirms condensation of mono- and bi-cyclic aromatics in presence of Al silicate. Elementary analysis of cuts shows S to be mainly present in bi-cyclic aromatics. V. B.

1444. Photo chemical oxidation of propane at high temperatures. N. V. Fok and A. B. Nalbandyan. *Doklady Akad. Nauk S.S.S.R.*, 1953, **89**, 125–7.—Mixture 1 : 1 C_3H_8/O_2 at 50 mm in quartz vessel at 100°–300° C. Yield of *iso*propyl peroxide, acetaldehyde, formaldehyde, acetone, CO_2, shown against temp for 30 sec contact; effect of varying mixture and contact time also examined. Rate of peroxide and acetaldehyde formation is linear function of light intensity, rate is not influenced by inert gas dilution. Concluded that peroxide radicals, destroyed on vessel walls, are main reaction centres. V. B.

1445. Oxidation of methane under conditions of adiabatic compression. M. S. Furman and D. S. Tsiklis. *Doklady Akad. Nauk S.S.S.R.*, 1953, **91**, 597–8.—Tests on CH_4 + 4% O_2 at pressures up to 8300 kg/cm² (2350° K). Reaction only commences at > 1200° K. HCHO and CO detected but no CO_2 or C. V. B.

1446. Cold-flame oxidation of propane. L. A. Repa and V. Ya. Shtern. *Doklady Akad. Nauk S.S.S.R.*, 1953, **91**, 309–12.—Mixture C_3H_8/O_2 at 280° C, 420 mm initial pressure. 3 cold flames observed. Analysis of mixture for HCHO, CH_3CHO, peroxides (*ca* 70% H_2O_2), CH_3OH, acids, C_2H_6, C_2H_4, CO, CO_2, O_2. General course of reaction and product ratios is similar to that for high-temp (350° C) oxidn. Flame appearance is a side reaction, and not cause of formation of aldehydes and peroxides. V. B.

1447. Investigation of propylene oxidation by the aid of radiocarbon. A. F. Lukovnikov and M. B. Neiman. *Doklady Akad. Nauk S.S.S.R.*, 1953, **91**, 581–4.—Equimol mixture $CH_3C^{14}H{=}CH_2/O_2$, 350° C, 290 mm. Products analysed for HCHO, CH_3CHO, glyceraldehyde, CO, CO_2. 80% of propylene is oxidized by chain rupture, leading to HCHO and CH_3CHO; remaining 20% forms acrolein, which further oxidizes to glyceraldehyde or pyruvaldehyde. V. B.

1448. Use of labelled carbon for studying mechanism of catalytic oxidation of ethylene on silver. S. Z. Roginskii and L. Ya. Margolis. *Doklady Akad. Nauk S.S.S.R.*, 1953, **89**, 515–17.—C^{14}-labelled ethylene oxidized, in presence of inactive C_2H_4O, with O_2 at 265° C and <0·5 mm pressure, static conditions. Results indicate that CO_2 is formed simultaneously and independently, both from C_2H_4O and through some other intermediate product, possibly of a peroxide type. Latter reaction is of a heterogeneous character, and will increase as Ag cat becomes progressively poisoned by excess C_2H_4O. V. B.

1449. Incomplete oxidation of propane–butane natural gas fraction in presence of boron oxide. P. A. Shoikhet, M. A. Trotsenko, and M. V. Polyakov. *Doklady Akad. Nauk S.S.S.R.*, 1953, **89**, 519–22.—Equimol mixture of C_3H_8–C_4H_{10} and O_2 oxidized under static conditions at 270° C in vessel of molybdenum–glass whose surface is covered to varying extent

with film of boron oxide. Reaction followed calorimetrically. Incomplete oxidn, first stable products of which are peroxides, is shown to be heterogeneous–homogeneous peroxide-governed chain reaction; the homogeneous phase is catalysed much more strongly by boron oxide than by the glass vessel walls.
V. B.

1450. Structure of aluminium stearate grease. D. Evans and J. B. Matthews. *J. Colloid Sci.*, 1954, **9**, 60–9.—Measurements have been made of the visc changes with time which a commercial aluminium stearate grease undergoes, immediately after it has been heated to given temp and maintained at these temp under shear. When the equilibrium visc attained at any temp is plotted against temp, the curve obtained indicates the occurrence of a phase transformation in the grease, which is considered to be the transition from the paste to the jelly. It is concluded that aluminium stearate grease is essentially a metastable jelly at temp below the transformation temp, but transforms slowly to a paste on ageing, the rate of transformation being accelerated by shear. (Authors' abstract.)
H. C. E.

1451. Interpretation of plastic viscosities in terms of Newtonian viscosities. R. C. Harper, Jr, and J. Riseman. *J. Colloid Sci.*, 1954, **9**, 81–6.—The visc of suspensions in petroleum oil of 4 grades of channel black were examined at concn from 1 to 4% wt. The flow curves were typical of plastic flow, and the plastic visc values were independent of the rate of shear over the range studied. It was found that the plot of $(U-\eta)/\eta c$ against c, where U is the plastic visc of the suspension at concn c and η is the Newtonian visc of the medium, gave straight lines for each grade of carbon. It is deduced that, after the shearing stress has exceeded the yield stress, the interference offered by the solute particles to the flow of the medium is completely similar to cases of Newtonian flow, and hence that a change in the applied shear-stress is associated with a change in the extent of agglomeration or particle size.
H. C. E.

1452. Combined hydro-dehydropolymerization by boron fluoride on platinum and chromium catalysts. Ya. M. Paushkin and G. N. Kislik. *Doklady Akad. Nauk S.S.S.R.*, 1953, **90**, 557–9.—*iso*Amylene over Pt–charcoal + BF_3 at 250°–400° C, compared with results using Pt–charcoal, charcoal + BF_3, $BF_3 + Cr_2O_3{\cdot}Al_2O_3$, $Cr_2O_3{\cdot}Al_2O_3$. Tests on reaction products indicate that Pt–charcoal + BF_3 at 400° C acts as cat, permitting simultaneous polymerization, cyclization, and hydrogenation.
V. B.

1453. Conversion of diene compounds in presence of oxide catalysts. Conversion of 2,3-dimethylbutadiene on aluminosilicate. S. R. Sergienko and N. V. Zhdanova. *Doklady Akad. Nauk S.S.S.R.*, 1953, **90**, 803–6.—2,3-dimethylbutadiene-1,3 at 250° C over Al silicate yielded 78–80% of catalysate (C_5 7–10%, dimers of dimethylbutadiene 35–40%); products analysed. Prolonged (8 hr) test shows effect of cat ageing, in initial stages diene polymerizes in cat pores with evolution of H, which reduces remainder of diene (mainly to 2,3-dimethylbutene-2); after about 4 hr percentage of diene in product steadily increases. Deposit on cat corresponds to $C_{30}H_{42}$, a polycyclic compound yielded by dehydrocyclization of 5 mol of starting diene.
V. B.

1454. Poisoning of aluminosilicate catalysts by pyridine bases. K. G. Miesserov. *Doklady Akad. Nauk S.S.S.R.*, 1953, **91**, 553–6.—Synthetic cat saturated with aq and Et_2O soln of pyridine and then blown with CO_2 at 320° C to remove physically adsorbed (as distinct from chem combined) C_5H_5N. Cat activity tested by reduction of *cyclo*hexene. For cat treated with Et_2O soln 5 milliequiv/100 g required for inactivation, for aq soln treated cat approx double this quantity, due to partial hydrolysis of cat, giving rise to exchangeable H ion requiring additional C_5H_5N for its neut.
V. B.

1455. Uniform chain mechanism of thermal decomposition of hydrocarbons. V. A. Poltorak and V. V. Voevodskii. *Doklady Akad. Nauk S.S.S.R.*, 1953, **91**, 589–91.—Cracking of C_3H_8 (50 mm), static conditions, 570°–600° C in presence of D_2 and D_2 + NO. All tests run to 10% conversion. C_2H_4 + C_2H_6 (latter <5%) separated from reaction products, burnt, and resultant water analysed for D_2O. Results indicate that both in presence and absence of NO, thermal decomp of C_3H_8 occurs via free radicals.
V. B.

1456. Elementary reactions of atomic oxygen with methane. L. I. Avramenko and R. V. Kolesnikova. *Doklady Akad. Nauk S.S.S.R.*, 1953, **91**, 107–9.—Technique as previously (*cf.* Abs. **634**, 1954). Reaction products detected were HCHO, MeOH, CO, CO_2. Addition of O_2 to reaction with gases from discharge through steam causes 25% increase in HCHO formation. Possible reaction mechanisms discussed.
V. B.

1457. Preparation and physical properties of sulphur compounds related to petroleum. Pt 3. Semi-aromatic sulphides. S. F. Birch, R. A. Dean, and E. V. Whitehead. *J. Inst. Petrol.*, 1954, **40**, 76–85. The synthesis, characterization, and physical properties of 4 typical bicyclic monosulphides and their reactions with several reagents are described.
A. R. W. B.

1458. Temperature–enthalpy data for ethylbenzene. D. S. Hoffman and J. H. Weber. *Petrol. Process.*, 1954, **9** (4), 545–7.—The thermodynamic data for ethylbenzene has been extended. Suitable correlations have been used so that enthalpy–temp data of engineering accuracy for temp of 280°–1280° F and pressures of 14·7–560·1 p.s.i.a. are available.
J. W. H.

1459. Formation and velocity of spherical explosion waves in gas mixtures. N. Manson. *Rev. Inst. franç. Pétrole*, 1954, **9**, 133–43.—Tests in latex balloons (30–68 cm dia, 20 g/cm², 2°–8° C) using C_2H_2; C_2H_6; C_3H_4-based mixture; natural gas (93% CH_4); results recorded photographically on rotating drum. In most cases ignition by detonator required to give rise to explosion wave, rate of which depends on mixture composition, and is similar to that reported for explosion waves in tubes. Explosion waves were obtainable only in oxygen–gas mixtures, not with air. Detonation limits for spherical waves were narrower than for plane waves (*i.e.* tubes). Results obtained confirm theories suggested by previous workers (Taylor, Zeldovich).
V. B.

1460. Isomerization reactions of paraffinic hydrocarbons catalysed by aluminium halides. H. Springer. *Rev. Inst. franç. Pétrole*, 1954, **9**, 103–22.—Review, mainly devoted to work since 1948, and covering cat composition (promoters, technical cat); results with butane, pentane, hexane, heptane, and higher; cracking and inhibitors thereof; tracer studies; discussion. 63 refs.
V. B.

1461. A method for approximate determination of viscosity–pressure–temperature relationships for oils. Results from an investigation of compressibility and viscosity. S. Lundberg. *J. Inst. Petrol.*, 1954, **40**, 104–15.—From the results obtained it appears that the log visc (in cs) is directly proportional to the pressure of the oil under isothermal conditions up to 20,000 p.s.i. For each oil the isothermal lines come from one point which can be called the visc–pressure pole. On this basis a method for determination of the visc–temp–pressure relationship of an oil is given.
A. R. W. B.

1462. Patents. Ger.P. 902,973, 17.12.53. Grosskinsky and Umbach, assrs to Bergwerksverband zur Verwertung von Schutzrechten der Kohlentech. G.m.b.H., Dortmund-Eving. Process and plant for oxidn of NH_3-Aq containing H_2S with recovery of ammonium sulphate or thiosulphate.
BrennstChemie, 1954, **35** (1–2).

Ger.P. 904,407, 31.12.53. Kürth, formerly Berlin Babelsberg, represented by Frau Molkentin, Berlin. Installation for influencing flowing masses (soln, suspensions, mixtures, colloids, etc.) or of aerosols, etc., by supersonant.

Ger.P. 904,047, 31.12.53. Nashan, assr to Bergbau AG, Neue Hoffnung, Oberhausen. Process and plant for operating reaction furnaces for oxidn of lower gaseous members of paraffin series.
BrennstChemie, 1954, **35** (3–4). R. T.

ANALYSIS AND TESTING

1463. Comparison of viscosities of American grades of cutback bitumens determined by Saybolt Furol viscometer and Standard Tar viscometer. C. M. Gough. *J. Inst. Petrol.*, 1954, **40**, 122.—A table of comparative results is given obtained on various cutback bitumens corresponding to the R.C. and M.C. 1, 2, 3, 4, 5 grades. A. R. W. B.

1464. Viscosity as a means in the graphical statistical analysis of mineral oils. C. Boelhouwer and H. I. Waterman. *J. Inst. Petrol.*, 1954, **40**, 116–19.—It is concluded that visc measurements of saturated mineral oil fractions, combined with refractive index determinations allow a rapid and accurate characterization of these products. Formulæ are given which predict from kin. visc., refractive index, and density of natural mineral oil fractions the corresponding constants of theoretical hydrogenated oils derived from the natural oil fractions. This allows graphical determination of mol. wt. and estimation of carbon distribution and aromatic and naphthenic ring contents of natural oils. A. R. W. B.

1465. Structural analysis of petroleum hydrocarbons. H. Umstätter. *Erdöl u. Kohle*, 1954, **7**, 207–11.—Better picture of hydrocarbon structure can be obtained on basis of elementary analysis and mol refraction than by the "*n–d–M*" method (*cf.* Abs. **196**, 1954). Examples of calculations given (including table of values for $n^2 - 1/n^2 + 2$ for $n = 1{\cdot}30$–$1{\cdot}69$). Additional information can be yielded by parachor; ultrasonic interferometer may also find application, although data for this latter are as yet inadequate. V. B.

1466. Type analysis of gasoline fractions. M. Killer. *Nafta (Yugoslavia)*, 1954, **5** (2), 46–51.—The hydrocarbon type analysis of gasoline fractions of 5 crude oils from the Mramorbrdo field is given, using the refractory intercept $n - d/2$ and a graphical technique for the detection of individual hydrocarbons based thereon. The paper represents a part of a project for structural investigations on domestic oils, carried out in the Institute of Petroleum in Zagreb.
(Author's abstract.)

1467. Accelerated determination of TEL in leaded fuels. M. Faieta. *Riv. Combust.*, 1953, **7** (9), 547–53.—A simple accelerated method for TEL determination is described, which is applicable to all types of leaded fuels. The method is rapid and precise, and requires a very simple apparatus.
(Author's summary.)

1468. Exact measurement of small loss angles of insulators at technical frequencies. Study of loss angle of insulating oils. P. Mirguet. *Bull. Inst. Electrotech. Montefiore (Liége)*, 1953, **66**, 391–500.—Following definition of loss angle and discussion of Schering bridge theory, description (with circuit diagram) is given of double-screen Schering bridge used in the investigation. Frequency used was 50 cs, bridge sensitivity is better than 1 in 10^4. Detector is vibration galvanometer with sensitivity of 10^{-9} amp, increased by amplification to $0{\cdot}5 \times 10^{-11}$ amp. Test cell (ASTM type) is of Monel metal, fitted with guard ring, oil film is 4 mm thick and stress used was 5 kV/cm. Electrode temp is measured by thermocouples. Cell takes 70 ml oil, and filled cell has capacity 45 pF. Cell cleaning technique is not critical, provided this is carried out hot (>50° C.) Relation between log tan δ and temp is linear, distinction is to be drawn between curve given by oil in its original (as delivered) state and after dehydration, latter curve is fundamentally characteristic of oil and has good reproducibility. Dehydration is preferably carried out in test cell. Results on several insulating oils (new and used) are given, and it is suggested that a value of tan δ of *ca* 0·05 (at 60° C) indicates deterioration of an oil to the stage at which transformer insulation begins to be affected. In frequency range 40–200 cs product of frequency × tan δ is const, in stress range 2–30 kV/cm effect of stress is slight, tan δ increasing with increasing stress. Numerous results given showing effect of ageing (90°–140° C) on tan δ. During ageing tests tan δ rises, but levels off (*ca* 0·1) at point where sludge is pptd. Whilst tan δ increases with acidity, relationship will vary for different oils, a tentative suggested limit figure is tan $\delta \approx 0{\cdot}1$ for used oils. Time taken to attain a fixed value of tan δ (*e.g.* 0·01) can be taken as a measure of oil stability. Catalysed oxidn tests, whilst susceptible to study by measurement of tan δ, become less essential with use of this method, owing to sensitivity of tan δ measurements, which can reduce non-catalysed tests to short duration and low temp. Inhibited oils show high initial tan δ (*ca* 0·01), and hence are not suitable for condensers, on ageing tan δ of inhibited oils shows initial drop followed by rise. Measurements of tan δ on oil mixtures confirm dependence of slope of tan δ-temp curve on visc; addition of Cu stearate (no effect on visc), whilst raising values of tan δ does not alter slope. V. B.

1469. How to determine arsenic traces in oil or catalyst. R. R. Jay and L. R. Dickson. *Petrol. Process.*, 1954, **9** (3), 374–6.—A method of arsenic determination is presented based on the ultimate conversion of arsenic to arsine by reduction with metallic zinc in an acid soln. The arsine thus formed is absorbed on a filter-paper impregnated with mercuric bromide, giving a yellow stain proportional to the wt of the arsine absorbed. This method may be used for analysing samples containing as little as 2–4 pts per billion of arsenic. The wt of the sample may be up to 25–50 g, but it should contain from 0·1 to 1·0 μg of elemental arsenic. J. W. H.

1470. I.F.P. electronic equipment for road testing of fuels. F. Kermarrec and J. Weissmann. *Rev. Inst. franç. Pétrole*, 1954, **9**, 87–102.—Detailed description of rev counter (100–5000 r.p.m., ±20) and spark advance indicator (70° BTDC – 10° ATDC, ±½°) for installation in vehicles for testing fuels by modified borderline procedure. Instruments are operated by magnetic coupling from crankshaft and secondary of H.T. system. At each engine revolution known amount of current from discharge of condenser is passed through milliammeter, reading of which thus indicates engine speed. Spark advance meter operates with the 2 signals, current flowing in the interval between them indicating degree of advance. Complete circuit diagrams. V. B.

1471. Fractional urea-adduct precipitation of technical paraffin waxes. W. Lommerzheim. *Erdöl u. Kohle*, 1954, **7**, 212–15.—3 waxes, spindle, engine oil, and cracked obtained by thermal cracking of petrolatum, having m.p. 47·5°, 56·8°, and 57·7° C respectively were fractionated. Solvent for waxes was "normalbenzin" saturated (3%) with CH_3OH, urea solvent was CH_3OH. Experimental technique described. Results compared with "sum" and "asymmetry" values found by the Grodde method (*cf.* Abs. **1123**, 1950). Adduct fractionation gives reliable indications of wax composition. Spindle wax had 70% *n*-paraffins and 25% slightly branched, engine oil wax only 25% *n*-paraffins, whilst cracked wax had no *n*-paraffins, preponderating components being 1- or 2-branched. V. B.

1472. Information on Turkish crude from Ramandag. IV. Communication. Sulphur content of Ramandag Turkish crude and its distribution over the individual fractions and classes of compounds. G. Schiemann and O. Finke. *BrennstChemie*, 1954, **35** (3–4), 47–9.—An investigation of Turkish crude by dist into fractions and asphaltic residue is discussed. In fraction A, boiling range 44°–150°; B, 50°–180°, and 16 mm Hg, and C, 172°–200° and 13 mm Hg the S occurs free, as H_2S, org compounds, mercaptans, dialkylsulphides, disulphides, and residual S compounds classed as thiophane, thiophene, and other higher cyclic S compounds. These last increase with increasing b.p of the fractions. Thus fraction C is characterized by its high cont of residual S compounds.

Fraction A contains elementary S, dialkylsulphides and residual S compounds, and alone contains free S. Fraction B is characterized by its higher cont of dialkylsulphides. This fraction, therefore, is suitable as a raw material for their recovery. Free S and H_2S are not present in the crude oil, but are formed on heating. Results are tabulated. R. T.

1473. Volumetric determination of cobalt as dead-point titration. H. Fritzsche. *BrennstChemie*, 1954, **35** (3–4), 49–51.—Apparatus and procedure for potentiometric performance of the volumetric estimation of CO, using the dead point method, are described and discussed. Speed compares favourably with the colour-indicator titration, and accuracy with the electrolytic process. Nickel does not interfere. The method is suitable for routine analyses in cat processes. R. T.

1474. Using mass spectrometry in aromatic hydrocarbon analyses. J. H. Shively and J. J. Morello. *Petrol. Process.*, 1954, **9** (4), 554–5.—The article deals with the methods available for the determination of aromatic hydrocarbons in petroleum naphthas with stress on the use of mass spectrometry. A typical analysis is given for such components as benzene, toluene, ethylbenzene, and xylene. The advantages of mass spectrometry over other methods of analysis in this particular case are also reviewed. J. W. H.

1475. Patents. U.S.P. 2,657,572 (19.5.47; 3.11.53). J. D. Fann. Visc measuring device.

U.S.P. 2,657,581 (24.7.50; 3.11.53). C. H. Fay and R. R. Goodell, assrs to Shell Development Co. Gravity meter.

U.S.P. 2,668,097 (1.5.50; 2.2.54). K. E. Hallikainen and D. J. Pompeo, assrs to Shell Development Co. Continuous electrometric titration system.

U.S.P. 2,669,865 (26.1.50; 23.2.54). J. Cole and J. Krawetz. Apparatus for testing oils for gum, varnish, sludge, and corrosion. J. M. S.

CRUDE OIL

1476. Study of some Middle East crudes. III. Qatar crude. Anon. *Rev. Inst. franç. Pétrole*, 1953, **8**, 436–42 (*cf.* Abs. **2045**, 1953).—Results of pilot plant evaluation. Crude (d_4^{15} 0·823, S 1·3%, wax 4·3%, asphaltenes 0·4%) atm and vac fract into 90 1% cuts which were tested and blended. Yields are (wt %): gas 2·3, gasoline (217° C) 33·1 (O.N. Motor 38 clear, + 0·05% TEL 47), kerosine) 212°–236° C) 5·0, gas oil (236°–348° C) 23·5 (cetane 62, pour —7° C). V. B.

GAS

1477. What's ahead for natural gas? R. J. Gonzalez. *Oil Gas J.*, 10.5.54, **53** (1), 124.—The natural gas industry is reviewed, the increase in reserves, expanding use of natural gas, prices, and future outlook being discussed. Tables show post-war changes in U.S.A. mineral energy production, actual production and consumption by major areas, prices, and interstate receipts. G. A. C.

1478. Annual natural gasoline plant survey. J. M. McGivern. *Oil Gas J.*, 26.4.54, **52** (51), 196.—The survey shows that post-war expansion in America exceeds 100%, and plants are listed state by state, headings being gas capacity, natural gasoline produced, L.P.G. produced, and gas injection. G. A. C.

1479. Tennessee gas transmission industry. G. Symonds *et al.* *Oil Gas J.*, 10.5.54, **53** (1), 92.—Commencing with a map of U.S.A. natural gas pipelines and an account of leading personnel of the Tennessee Gas Transmission Co, a forecast is then given for the industry 10 years hence. Underground storage, improved station design and operation research, electronic communication and corrosion control, new instruments to improve gas measurement, and use of airplanes for line patrol and personnel movement are among subjects dealt with. G. A. C.

1480. Developments and trends in the chemical utilization of natural gas. C. Padovani. *Riv. Combust.*, 1953, **7** (10), 609–26.—Hydrocarbons from natural gas are progressively displacing coal and coal derivatives from their place as the main raw material for chemical syntheses. Pyrolysis (with the production of hydrogen, aromatic hydrocarbons, and acetylene), incomplete oxidation (with the production of hydrogen or hydrogen–carbon monoxide mixtures), and different chemical reactions (chlorination, nitration, sulphurization, and so on) are the methods of attack at present employed for chemical utilization of natural gas. Trends and developments of chemical utilization of natural gas by the Italian chemical industry are discussed. 10% of overall Italian natural gas production is consumed by chemical industries (both for thermal and chemical purposes). Main utilization is for ammonia and fertilizers, hydrogen cyanide, and chlorinated products. (Author's summary.)

1481. Studies in the composition of Cortemaggiore natural gasoline. V. Berti, T. Bottiglia, and C. Caroti. *Riv. Combust.*, 1953, **7** (12), 777–97.—Natural gasoline from Cortemaggiore (Parma) gas field is among the most interesting products of Italian hydrocarbon industry and has a very high octane rating. The composition by hydrocarbon types of fraction boiling below 150° C has been determined, and component hydrocarbons have been investigated in the cut boiling between 65° and 90° C. Naphthenic hydrocarbons have been quantitively determined, paraffins have been only qualitatively detected. Fractional dist analysis and infra-red spectrography methods have been employed. Cortemaggiore natural gasoline can be classified as paraffinic. In the fraction boiling between 65° and 90° C, isomeric alkanes prevail over *n*-alkanes. The presence of triptane (2 : 2 : 3-trimethylbutane), which is not generally supposed to be a component of natural products, has been definitely ascertained in Cortemaggiore gasoline, in noticeable amounts. (Authors' summary.)

ENGINE FUELS

1482. Combustion and deposit formation in diesel engines. F. Jostes. *Erdöl u. Kohle*, 1954, **7**, 160–2.—Test results on 4 engines (fuel: 201°–365° C, cetane no. 54·5) up to 200 hr show favourable deposit-removing action (in combustion space and exhaust passages) of proprietary (composition not given) fuel additive used in concn of 4%. From analysis of deposits with and without additive it is concluded that view put forward by Meurer (*Automobiltechn Z.*, 1953, **55**, 193) that appreciable part of fuel combustion occurs at combustion space wall is confirmed. Additive exerts solvent action on both C_6H_6-sol and-insol deposits. V. B.

1483. Determination of boiling range of spark-ignition engine fuels and gasolines. Anon. *Erdöl u. Kohle*, 1953, **6**, 633–4.—German (draft) standard DIN 51 751. Re-issue of draft owing to numerous amendments proposed to original version (*cf.* Abs. **2761**, 1950). Method essentially based on ASTM D 86–46. Atm pressure correction table and accuracy clause taken from IP 123/49. V. B.

1484. Determination of boiling range of diesel fuels and similar materials. Anon. *Erdöl u. Kohle*, 1953, **6**, 635–6.—German (draft) standard DIN 51 752. Re-issue of draft owing to numerous amendments proposed to original version (*cf.* Abs. **2710**, 1951). Method essentially based on ASTM D 158–41. Atm pressure correction table and accuracy clause taken from IP 123/49. V. B.

1485. Looking ahead with diesel fuels. Anon. *Petrol. Process.*, 1954, **9** (5), 681–3.—A 35% increase in the demand for diesel fuels is expected by 1960—from 6·7 billion gal in 1953 to *ca* 9 billion gal in 1960. The availability of new types of lub oils will promote the use of the lower quality diesel fuels by compensating for some of their so-called ill effects. It is also expected that additives will be used to a greater extent in the lower grade diesel fuels. J. W. H.

1486. What amyl nitrate does to improve diesel fuels. E. A. Desmond and G. C. Wilson. *Petrol. Process.*, 1954, **9** (5), 684–7.—The use of amyl nitrate as a diesel fuel ignition improver is fully discussed, and it has been shown that its availability will permit a refiner to upgrade the ignition quality of available middle dist to meet ASTM requirements except for the lack of adequate cetane number.

Considerable information is also given concerning the properties of amyl nitrate. J. W. H.

1487. Ash in fuel for gas turbines. Anon. *Mot. Ship*, Feb. 1954, **34** (407), 501.—A brief description is given of the process for modifying the harmful effects of ash in gas turbines running on residual fuels, which has been patented by the Shell organization. The process entails the addition of a phosphorus compound to the fuel. U. M.

1488. Patents. U.S.P. 2,657,982 (24.12.49; 3.11.53). E. F. Hill and M. L. Welp, assrs to Ethyl Corpn. Synergistic anti-oxidant composition consisting of a lower alkyl-*p*-phenylenediamine and an alkyl mercaptan of 4–12 carbon atoms, furfuryl mercaptan, a lower alkyl ester of thioglycolic acid, 2-mercaptoimidazolidine, or a lower alkyl-2-mercaptoimidazolidine.

U.S.P. 2,657,983 (18.3.52; 3.11.53). E. F. Hill and M. L. Osip, assrs to Ethyl Corpn. Synergistic anti-oxidant composition consisting of an alkyl thioglycolate and an aminophenol.

U.S.P. 2,657,985 (29.12.49; 3.11.53). H. G. Schutze and H. E. Cier, assrs to Standard Oil Development Co. Motor fuel consisting of 2 : 2 : 3-trimethylbutane, 2 : 2 : 3 : 3-tetramethylbutane, and 2 : 2 : 3 : 3 : 4-pentamethylpentane in the ratio 2 : 4 : 2.

U.S.P. 2,658,874 (7.11.44; 10.11.53). J. P. Clay and H. B. Elkins, assrs to U.S.A. (Secretary of War). Plastic chemical smoke producing filling for munitions consisting of gasoline or xylene, 2–6% *iso*butylmethacrylate polymers, and 50–75% red phosphorus.

U.S.P. 2,660,591 (18.3.52; 24.11.53). G. Calingaert, assr to Ethyl Corpn. Lead alkyl compositions are stabilized with an alkyl nitro compound, an alkyl nitrite or nitrate, azobenzene, 2 : 2′-azonaphthalene or 4-benzeneazo-1-naphthylamine.

U.S.P. 2,660,592 (18.3.52; 24.11.53). G. Calingaert, assr to Ethyl Corpn. Lead alkyl compositions are stabilized with glyceryl monostearate, glycol dilaurate, 2-methyl-2 : 4-pentanediol, ethylene bromohydrin, furfural, furfuryl alcohol, ethylnyl*cyclo*hexanol, tiglic alcohol, α-terpineol, crotonaldehyde, 2-amino-2-methyl-1-propanol, or 2-ethyl-1 : 3-hexanediol.

U.S.P. 2,660,593 (18.3.52; 24.11.52). G. Calingaert, assr to Ethyl Corpn. Lead alkyl compositions are stabilized with alloxan, *p*-nitrobenzoic acid, oleic acid, maleic anhydride, aluminium oleate, phthalic anhydride, aconitic acid, chlorophyll, semicarbazide hydrochloride, or cinnamic acid bromide.

U.S.P. 2,660,594 (18.3.52; 24.11.53). G. Calingaert, assr to Ethyl Corpn. The isolation of TEL by steam dist from a reaction mixture is carried out in the presence of styrene dibromide, stearyliodide, allyl *iso*thiocyanate, triphenylchloromethane, hexachloroethane, iodoform, ethylene dibromide, or ethyl thiocyanate as a thermal stabilizer.

U.S.P. 2,660,595 (24.3.52; 24.11.53). G. Calingaert, assr to Ethyl Corpn. Lead alkyl compositions are stabilized with allo-ocimene, butadiene, diamylene, dipentene, heptene, tri- or tetra-methylethylene, *cyclo*hexene, di*cyclo*pentadiene, allyl iodide, chloroprene, hexachloropropylene, di-*iso*butylene, or tribromoethylene.

U.S.P. 2,660,596 (24.3.52; 24.11.53). G. Calingaert, assr to Ethyl Corpn. The isolation of TEL by steam dist from a reaction mixture is carried out in the presence of a fused ring hydrocarbon or an aryl-substituted olefin or a halo-substitution product thereof as a thermal stabilizer. J. M. S.

U.S.P. 2,662,817 (22.12.48; 15.12.53). B. B. Russell and N. H. Rickles, assrs to Standard Oil Development Co. A jet turbine fuel comprising a hydrocarbon fuel base having an initial b.p. of *ca* 315° F, a 10% dist point below *ca* 410° F, and a final dist point below *ca* 572° F, the fuel base having a kin. visc. at −40° F of *ca* 10·6, and *ca* 25–75% by vol of a mixture of methanol and *iso*propanol.

U.S.P. 2,664,388 (19.9.51; 29.12.53). J. S. Winterhalter, assr to Socony-Vacuum Oil Co. A hydrocarbon fuel oil of lowered pour point containing between *ca* 0·05% and *ca* 7%, by wt, of a residual stock obtained from crude petroleum produced in the Smackover field, which stock has the following properties: API gravity, 15·0–16·0; Saybolt Universal Visc at 210° F, 150–225 sec; Fl. pt., 255°–365° F; Carbon no. (Conradson), 4·0–5·0. D. A. R.

U.S.P. 2,668,522 (29.11.51; 9.2.54). J. E. Hickok and J. A. Ryan, assrs to Standard Oil Development Co. Gasoline containing 0·5% solvent oil, 1·9% dimethyl carbinol, and 0·1% di-*iso*propyl ether. The solvent oil is a liq hydrocarbon mixture having a kauri-butanol value above 20, a 50% dist pt above 350° F at 10 mm mercury pressure, a Saybolt visc at 100° F not above 450 sec and an API gravity of 18°–28°. The additives prevent carburettor icing when operating under moist, cool conditions. J. M. S.

Ger.P. 902,293, 3.12.53. — Velde, assr to Ruhrchemie AG, Oberhausen-Holten. Process for obtaining knockproof motor fuels from primary products of cat CO hydrogenation.

BrennstChemie, 1954, **35** (1–2).

Ger.P. 903,572, 24.12.53. — Fisher, — Pichler, and — Ziesecke, assrs to Studien-u. Verwertungs-Ges. m.b.H., Mülheim (Ruhr). Method for producing knockproof hydrocarbons.

BrennstChemie, 1954, **35** (3–4). R. T.

GAS OIL AND FUEL OIL

1489. Patents. U.S.P. 2,657,984 (20.10.50; 3.11.53). C. H. Braithwaite, G. A. Martin, and R. E. Sutton, assrs to Shell Development Co. Alkylureas are used as pour-point depressants for dist fuel oils.

U.S.P. 2,658,823 (28.8.51; 10.11.53). J. H. Andress, assr to Socony-Vacuum Oil Co. Dist fuel oil containing an alkaline earth metal salt of tall oil to inhibit sludging and sedimentation during storage.

U.S.P. 2,658,666 (10.11.49; 17.11.53). R. W. Sage and L. A. Jennings, assrs to Standard Oil Development Co. Bunker fuel oil containing triphenyl carbinol to inhibit sediment formation. J. M. S.

LUBRICANTS

1490. The friction of non-metallic solids. F. P. Bowden. *J. Inst. Petrol.*, 1954, **40**, 89–101.—The friction mechanism for non-metals appears very similar to that for metals being due primarily to adhesion at points of local contact. Differences in the behaviour of various solids are due mainly to the difference in their mechanical properties. Various examples are discussed illustrating these points. A. R. W. B.

1491. Properties, grading, and applications of industrial lubricants. J. M. N. Kuckhoff. *Erdöl u. Kohle*, 1954, **7**, 253–5.—Elementary discussion, with tabulation of lubricant (oils, greases) properties and uses. Lubricants comprise 6–7% of W. German petroleum consumption. V. B.

1492. Phosphorus in lubricating oil additives. G. Avico and N. Teherkezoff. *Rev. Inst. franç. Pétrole*, 1954, **9**, 51–66.—Review, mainly of patent literature. Products considered under 2 main heads: (*a*) those obtained from P_2S_5 (by action on alcohols, mercaptans, acids, amines, amides), including those with double bonds, and O-containing, and (*b*) those obtained from halogen and oxy-halogen P compounds. Most widely used P additives at present are diesters of dithiophosphates. 130 refs. V. B.

1493. Wall-effect and viscosity–temperature properties of Na greases. V. V. Sinitsyn and G. V. Vinogradov. *Doklady Akad. Nauk S.S.S.R.*, 1953, **91**, 323–6.—Flow studies in glass (R 0·25–0·98 mm, L 68–170 mm) and Cu (R 1·5–3 mm, L 200–1000 mm) capillaries for 2 greases (20% soap in oil of visc 78 cp-20° C; 12% soap in oil of visc 23 cp-20° C). Wall-slip effect, yielding non-reproducible flow curves, accentuated in grained materials having high disperse phase content at low visc of dispersing medium (and hence at high temp).

V. B.

1494. Patents. U.S.P. 2,657,900 (10.5.52; 3.11.53). E. O. Hook and L. C. Beegle, assrs to American Cyanamid Co. S-(sulphurized terpene hydrocarbon) dithiophosphoric acid triesters are used as anti-oxidants for hydrocarbon oils.

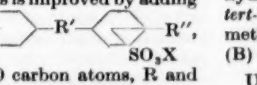
U.S.P. 2,658,037 (26.9.50; 3.11.53). E. Orno-Ornfeldt, assr to Chemieprodukte G.m.b.H. Lub greases are made by saponifying an unsaturated animal oil or fat with caustic soda, adding mineral oil and 2–4% beeswax, heating to drive off water, cooling, grinding, dissolving in a liq hydrocarbon, ageing the soln for *ca* 24 hr, and adding 2–5% of the product to the mineral oil to be formed into a grease.

U.S.P. 2,658,062 (17.9.49; 3.11.53). R. H. Jones, assr to Standard Oil Development Co. Mineral oil additive made by reacting a reaction product of phosphorus and sulphur or a phosphorus sulphide with a hydrocarbon, or a metal salt of such reaction product, with a compound of the formula $R_2N{\cdot}NR{\cdot}CX{\cdot}NR_2$, where R is hydrogen or a hydrocarbon radical and X is oxygen or sulphur, or an inorganic acid salt thereof.

U.S.P. 2,658,869 (24.6.50; 10.11.53). F. H. Stross, S. T. Abrams, and W. H. Peterson, assrs to Shell Development Co. Lub grease comprising a lub oil, an amorphous gel of a mixture of silica or a polyvalent metal silicate and a polyvalent metal oxide or hydroxide, and a hydrophobic surface active agent.

U.S.P. 2,658,870 (3.3.53; 10.11.53). H. A. Ambrose and O. L. Brandes, assrs to Gulf Research and Development Co. Cutting oil consisting of at least 50 wt % mineral lub oil having a visc of 70–300 S.S.U. at 100° F, 1–20 wt % mineral lub oil having a visc of 100–200 S.S.U. at 210° F, 0·5–15 wt % fixed fatty oil and 1–10 wt % solvent extract from a petroleum dist oil, the extract having a visc of 55–70 S.S.U. at 210° F.

U.S.P. 2,658,871 (3.9.49; 10.11.53). P. V. Smith and J. B. McPherson, assrs to Standard Oil Development Co. Mineral lub oil containing an ester formed by reacting phosphorus oxychloride with the crude product obtained by subjecting a copolymer of propylene and butylene to the OXO process.

U.S.P. 2,659,694 (8.9.52; 17.11.53). S. B. Lippincott, F. N. Baumgartner, and H. L. Yowell, assrs to Standard Oil Development Co. Detergency of lub oils is improved by adding a sulphonate of the formula  , where R′ is an alkylene group of 1–10 carbon atoms, R and R″ are alkyl groups containing together at least 15 carbon atoms, and X is an alkali or alkaline earth metal or the radical of a nitrogen base.

U.S.P. 2,659,695 (6.1.51; 17.11.53). J. Faust, assr to L. Sonneborn Sons Inc. Lub greases are prepared by dissolving a fat or fatty acid in a mineral lub oil and contacting with a water-in-oil emulsion containing a petroleum mahogany sulphonate dissolved in the oil and a metal hydroxide dispersed throughout the emulsion.

U.S.P. 2,659,696 (17.7.50; 17.11.53). L. L. Neff, assr to Union Oil Co of California. Mineral lub oil containing 0·05–20 wt % of an oil-sol metal salt of the reaction product obtained by condensing, in the presence of an acid condensation cat, at −20° to 200° C between 0·5 and 3 mol of a hydrocarbon substituted phenol containing 4–30 carbon atoms in the substituent, with 1 mol of an olefin oxide containing 2–8 carbon atoms.

U.S.P. 2,659,697 (25.1.50; 17.11.53). S. J. Wayo, assr to Sinclair Refining Co. Lub oils containing an acyloxyacetic acid with at least 8 carbon atoms in the acyl group, as a rust inhibitor.

U.S.P. 2,659,699 (28.7.49; 17.11.53). M. F. George and P. M. Reedy, assrs to Lockheed Aircraft Corpn. Hydraulic fluids comprising trialkyl phosphates and glycerol or ethylene, diethylene, propylene, butylene or tetraethylene glycol, or a polypropylene glycol having a mol. wt. of 400–1200.

U.S.P. 2,659,705 (1.7.50; 17.11.53). L. A. Mikeska, assr to Standard Oil Development Co. Oxidn inhibitor for petroleum hydrocarbons is a soluble group I, II, or III metal salt of a product obtained by reacting a sulphurized unsaturated monohydric aliphatic alcohol of 2–20 carbon atoms, a saturated monohydric aliphatic alcohol of 1–20 carbon atoms, and phosphorus penta- or hepta-sulphide.

U.S.P. 2,660,562 (26.3.51; 24.11.53). W. N. Axe and W. B. Whitney, assrs to Phillips Petroleum Co. Lub oils containing an oil-soluble guanidine salt of an alkyl aryl sulphonic acid or a petroleum sulphonic acid.

U.S.P. 2,660,563 (28.7.49; 24.11.53). F. W. Banes and S. B. Lippincott, assrs to Standard Oil Development Co. Mineral oils containing 0·1–5·0% of a modified polymer of a multi-olefin.

U.S.P. 2,668,098 (18.11.50; 2.2.54). R. M. Alm, assr to Standard Oil Co. Hydrocarbons are gelled with a salt of the formula RCH_2OCSSM, where R is a branched alkyl group of 12–24 carbon atoms and M is a Group I, II, III, or IV metal.

U.S.P. 2,668,145 (4.8.51; 2.2.54). G. S. Ronay, assr to Shell Development Co. Lub oil containing 0·1–0·5 % wt of clay modified by an amine or quaternary ammonium compound.

U.S.P. 2,668,146 (23.7.49; 2.2.54). T. H. Cafcas and A. W. Lindert, assrs to Standard Oil Co. Metal-working composition comprising 45–95% hydrocarbon oil, 5–40% alkali metal, ammonium or amine soap of an oil soluble sulphonic acid and of a naphthenic acid, and 0·01–5% tannic acid.

U.S.P. 2,668,757 (31.8.49; 9.2.54). V. L. Hansley assr to E. I. du Pont de Nemours and Co. Dispersions of carbon particles in organic liq containing alkali metal soaps.

U.S.P. 2,668,848 (7.10.49; 9.2.54). M. B. Neuworth, assr to Socony-Vacuum Oil Co. Synthetic lubricants made by reacting a mono-ester of adipic acid and a branched chain aliphatic alcohol of 6–20 carbon atoms, with ethylene glycol or a polyethylene glycol and thiodiglycol.

U.S.P. 2,669,507 (4.5.50; 16.2.54). D. W. Young, assr to Standard Oil Development Co. Anti-oxidant composition comprising (A) 2-*tert*-butyl-4-methoxyphenol, 2 : 2-bis(2 hydroxy-5-methoxyphenyl) propane, 2 : 2-bis(2 hydroxy-3-*tert*-butyl-5-methoxyphenyl) propane, styrene alkylated 4-methoxyphenol or 2 : 6-di-*tert*-butyl-4-methoxyphenol, and (B) 2-mercaptoethanoic acid or 3-mercaptopropionic acid.

U.S.P. 2,669,543 (15.4.49; 16.2.54). S. Hirsch, assr to Cangill Inc. Grease comprising mineral oil and a soap mixture formed by saponifying the product resulting from the oxidn of heavy aliphatic hydrocarbons.

U.S.P. 2,669,544 (17.11.51; 16.2.54). W. Lowe, assr to California Research Corpn. Lub oil containing a benzothiazyl sulphonamide.

U.S.P. 2,669,560 (21.9.50; 16.2.54). E. H. Sperry, assr to Sun Oil Co. Lub oils are sulphurated by contact in the liq phase at 250°–400° F with sulphur in the presence of iodine.

U.S.P. 2,670,330 (29.9.50; 23.2.54). D. P. Clark, assr to Gulf Research and Development Co. Cutting oil consisting of a stable soln of flowers of sulphur and a phosphatide in a mineral oil having an an. pt. below 85° C.

J. M. S.

Ger.P. 902,373, 3.12.53. Clar and Geiser, assrs to Ruhrchemie AG, Oberhausen-Holten. Method for producing ageing-resistant lub oils from olefinic hydrocarbons.

Ger.P. 902,292, 3.12.53. Tramm, assr to Otto & Comp. G.m.b.H., Bochum. Process for dist processing of oils.

Ger.P. 902,845, 10.12.53. Oettinger and Göhre, assrs to BASF, Ludwigshafen (Rhein). Process for converting crude oils or their residues. (Addn. to Pat. 821,684.)

BrennstChemie, 1954, **35** (1–2). R. T.

BITUMEN, ASPHALT, AND TAR

1495. Development of method for obtaining road surfacing bitumen from Volga shale tars. V. K. Klimov *et al.* *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk*, 1953, 1383–92.—Raw material for lab experiments was shale tar fraction with b.p >320° C, d_{20} 1·064; this was air-blown at 170°–180° C, effect of blowing rate and duration studied. Material obtained had (as compared with feed) m.p. (R. & B.) 36°–56° C (30° C), asphaltenes 13–24% (12%), resins 23–35% (31%), oil 19–28% (56%). Tests on blown bitumens after heating (5 hr, 163° C) showed little change, indicating good stability, as against feed which showed considerable change. Tests on asphalt–concrete mixes (bitumen (m.p. 42°–44° C) 7·6%, sand 74%, limestone 18·2%) were satisfactory; results given on plant-produced material after one month use as road surfacing. V. B.

1496. Graphical method for combining aggregates. J. R. Martin. *Rds & Str.*, 1954, **97** (3), 106–8.—The author describes a very simple graphical method for dealing with aggregate gradings. No preparation is involved and very little experience required. The use of simple linear graph paper and an engineer's rule enables one to calculate the relative proportions of a number of aggregates, the gradings of which are known, necessary to produce an aggregate with any specified grading. The article is amply illustrated, and includes suitable examples. R. H.

1497. Retention of aggregate by asphalt surface treatments. A. J. Benson and B. M. Gallaway. *Rds & Str.*, 1954, **97** (4), 113–22.—The effect of the following variables upon surface treatments has been studied: (1) variation in quantity of aggregate and bitumen applied, on quantity of aggregate retained; (2) variations in grading on quantity of aggregate retained; (3) time between application of bitumen and aggregate, upon adhesion of the aggregate; (4) presence of moisture in aggregate upon adhesion; (5) prerence of dust on the aggregate upon adhesion; (6) " wet dusty " condition of aggregate upon adhesion; (7) type of bitumen upon tenacity with which the aggregate is held.

Full details of the laboratory procedures employed and documented results on the basis of the above factors are given.

10 definite conclusions based upon the results of this work are enumerated. R. H.

1498. Features of bitumen utilization in hydraulic engineering. F. F. Zitscher. *Erdöl u. Kohle*, 1954, **7**, 215–18.—Review (illustrated) dealing with application of bitumen in various forms to reservoir, coast protection, and similar works in the U.S.A., Holland, and Germany. V. B.

1499. Addition of latex to bitumen emulsions. R. Bugeon. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (1), 3–8 (*cf.* Abs. **2206**, 1951, **573**, 1952; **184, 1444**, 1953).—Following a discussion of bitumen emulsification, the preparation of emulsion–latex mixtures is described. These mixtures, applied cold, improve the heat sensitivity of the bitumen remaining in road surfacings. The results of the experiments show general equality to conventional emulsions, in some cases—with special types of stone—superior adhesive power. Charts and photographs are given. R. T.

1500. Roofing compositions—processing. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (1), 22–6.—In Pt 8 faults, causes, and remedies are tabulated and discussed fully. R. T.

1501. Patents. U.S.P. 2,658,026 (27.6.51; 3.11.53). F. H. MacLaren and M. L. Kalinowski, assrs to Standard Oil Co. Bitumen is mixed with an asphaltic resin obtained from deasphalting a pet residuum.

U.S.P. 2,668,774 (12.9.50; 9.2.54). L. H. Heyl. Mould surface coating for use in metal casting consisting of a refractory material, an aq bitumen emulsion, and water.

U.S.P. 2,669,525 (3.8.49; 16.2.54). D. W. Bransky, J. A. Bolt, M. W. Stacy, and M. Feller, assrs to Standard Oil Co. Bitumen doped with a composition comprising 20–30% calcium sulphonate derived from sulphuric acid sludge from the treatment of hydrocarbon oils with sulphuric acid, 35–60% solvent having a b.p >220° F and an aromatic content of at least 40%, 4–8% alkyl carbinol of 2–16 carbon atoms, <35% water, and 5–10% hydrocarbon oil other than the solvent.

U.S.P. 2,670,304 (30.10.50; 23.2.54). P. E. McCoy, assr to American Bitumuls and Asphalt Co. An electrolyte is added to a hot oil-in-water type bituminous emulsion meeting ASTM spec D-401 and the emulsion subjected to a high speed grinding, shearing action. The emulsion remains stable during storage and handling. J. M. S.

SPECIAL HYDROCARBON PRODUCTS

1502. Patents. U.S.P. 2,657,425 (G.B. 18.5.50; 3.11.53). D. J. Keogh, assr to Price's Patent Candle Co. Apparatus for making tipped candles from a continuous rod of wax-covered wick.

U.S.P. 2,658,004 (11.3.50; 3.11.53). J. C. Eldridge and F. A. Flaherty, assrs to United Shoe Machinery Corpn. A dispersion of mica in an aq emulsion of wax is used as a last slip for removing shoes from lasts.

U.S.P. 2,659,683 (Netherlands 2.7.51; 17.11.53). W. M. Mazee and H. J. Loois, assrs to Shell Development Co. In the preparation of waxed paper by passing a web of paper through molten paraffin wax and immediately cooling, the cooling is effected by immersing the wax-impregnated paper in mercury maintained at 0°–20° C.

U.S.P. 2,668,150 (26.3.51; 2.2.54). G. W. Luvisi, assr to National Aluminate Corpn. Anti-foam composition consisting of 1–5% wt paraffin wax, 5–15% wt fatty acid containing 12–30 carbon atoms, 5–20% wt polyoxyethylene glycol dilaurate, and 1–25% wt polyoxypropylene glycol or a mono- or di-ester thereof, all dissolved in a hydrophobic solvent.

U.S.P. 2,669,524 (8.9.50; 16.2.54). N. G. Mailander, assr to S. C. Johnson and Son. Water-repelling composition for fabrics comprising 1–10% wt petroleum wax or polymerized octadecyl vinyl ether, 0·1–3% zirconium ethoxide, and a volatile liq aromatic hydrocarbon or aliphatic halogenated hydrocarbon.

U.S.P. 2,670,303 (8.9.50; 23.2.54). N. G. Mailander, assr to S. C. Johnson and Son. Similar to U.S.P. 2,669,524, but an aluminium or zirconium alkoxide having 3–18 carbon atoms is used.

U.S.P. 2,670,323 (6.1.51; 23.2.54). M. V. Hunter and J. R. Segesser, assrs to California Research Corpn. Paraffin wax having a m.p. of 125°–135° F, consisting of 20–35% non-straight-chain dist paraffin wax having a mol. wt. of 350–525 and 80–65% straight-chain dist paraffin wax having a m.p. of 127°–140° F and an average mol. wt. below that of the other component. J. M. S.

Ger.P. 902,375, 3.12.53 — Brendlein, assr to Deutsche Gold- und Silber-Scheideanstalt, formerly Roessler, Frankfurt (M). Method for producing methanol.

Ger.P. 902,492, 10.12.53. — Hagemann, assr to Ruhrchemie AG, Oberhausen-Holten. Process for obtaining synthetic aliphatic alcohols.

Ger.P. 902,852, 10.12.53 — Hügel, assr to Rheinpreussen AG für Bergbau und Chemie, Homberg. Method for producing unsaturated hydrocarbons.

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Ger.P. 903,576, 24.12.53. — Schiller and — Nienburg. Method for producing *iso*butylene.

Ger.P. 903,457, 24.12.53. — Liethen and — Rottig, assrs to Ruhrchemie AG, Oberhausen-Holten. Method for producing mixtures of unsaturated and saturated ethers.

Ger.P. 903,455, 24.12.53. Hopff and Münster, assrs to BASF, Ludwigshafen (Rhein). Method for producing pure polyglycol ethers or their derivatives.

BrennstChemie, 1954, **35** (3–4). R. T.

DERIVED CHEMICAL PRODUCTS

1503. New research centre for Dow. Anon. *Petrol. Process.*, 1954, **9** (3), 390–1.—A new $2½ million research centre has recently been built for Dow Chemical Co at Freeport, U.S.A. Petrochemical research will play a prominent part in the many varied activities at this new centre. J. W. H.

1504. Petrochemical profits from refinery coke. E. L. Jones, F. D. Parker, and W. B. Strobel. *Petrol. Process.*, 1954, **9** (5), 734–7.—The practical aspect of converting refinery coke into acetylene via the calcium carbide route is discussed with special reference to a refinery with a 40,000 b.d. output, although mention is given to the small refiner whose capacity is small.

Flow diagrams and material balances are given, together with the expected profits. J. W. H.

1505. Silicones—new tools for petroleum operations. F. L Resen. *Oil Gas J.*, 31.5.54, **53** (4), 66.—Silicones have proved themselves useful during the last 10 years in a number of refining applications. A silicone defoamer is used in the Pan American Refining Corpn, Texas City, refinery acid–gas absorption unit, and a concn of only a few parts per million of a silicone fluid is an effective defoamer for lub oils. Silicone coating prevents wax from sticking in moulds, and silicones are also used for electrical insulation, protective coatings, and in paints. A brief description of their manufacture is also given. G. A. C.

1506. New method of synthesis of spiro-(4,4)-nonadiene-(1,3)- and spiro-(4,4)-nonane. R. Ya. Levina and T. I. Tantsyreva. *Doklady Akad. Nauk S.S.S.R.*, 1953, **89**, 697–9.—*cyclo*Pentadiene added to soln of Na in liq NH_3 at −79° C, followed by 1,4-dibromobutane, yielded 21–22% (on dibromobutane) of spiro-(4,4)-nonadiene-(1,3) (b.p. 1052° C_{10}, n_D^{20} 1·4790, d_4^{20} 0·8849, adduct with maleic anhydride m.p. 98° C) which hydrogenated (50% yield) to spiro-(4,4)-nonane. V. B.

1507. Textiles from petroleum. P. Sherwood. *Chim. et Industr.*, 1953, **70**, 886–90.—*Cf.* Abs. **2070**, 1953.

1508. A method of making perchloroethylene from methane and clorine. F. Zanetti, C. Longiave, and A. Forni. *Rev. Combust.*, 1953, **7** (10), 649–55.—In the preparation of perchloroethylene by direct chlorination of methane, a certain amount of undesirable by-products (mainly carbon tetrachloride) is formed. Perchloroethylene–by-products ratio has been substantially increased by recycling at the reactor's inlet a controlled stream of hot reacted gases. (Authors' summary.)

1509. Patents. U.S.P. 2,658,038 (21.12.49; 3.11.53). W. A. Proell, assr to Standard Oil Co. Disulphoxides of the formula R·SO·CR′R″·CR″·R″·SO·R, where R is an alkyl group of 1–3 carbon atoms, R′ is an alkyl group of 6–25 carbon atoms, and R″ is hydrogen or an alkyl group of 1–6 carbon atoms.

U.S.P. 2,658,089 (28.4.50; 3.11.53). V. N. Ipatieff and H. Pines, assrs to Universal Oil Products Co. 1-Alkyl-1-aryl*cyclo*hexanes are dehydrogenated in the presence of a dehydrogenation cat and an acid-acting isomerizing cat to form fused ring polycyclic hydrocarbons having at least one ring more than the starting material.

U.S.P. 2,658,090 (15.2.50; 3.11.53). N. Geiser and H. Kolling, assrs to Ruhrchemie Akt. Olefins are made by mixing an alkyl chloride with an aluminium hydrosilicate in the liq phase and maintaining at 180°–250° C while continuously dist off the HCl and olefin.

U.S.P. 2,658,821 (26.10.50; 10.11.53). H. L. Ammann. Chamber reactor for production of carbon black by the explosion method.

U.S.P. 2,658,900 (15.2.51; 10.11.53). D. R. Stevens and S. C. Camp, assrs to Gulf Research and Development Co. Di-*iso*butylene (A) is sulphurized by charging A beneath the surface of a molten mass of sulphur at 200°–230° C and a pressure between 25 and 120 p.s.i. and removing hydrogen sulphide from the reaction mass as rapidly as it is formed.

U.S.P. 2,658,906 (29.7.49; 10.11.53). B. S. Pace, assr to Stanolind Oil and Gas Co. Synthesis oil is freed from metal contaminants by adjusting its pH to at least 10 and separating the oil phase from the soap phase. The soap phase is neutralized and the metal contaminants solvent extracted therefrom.

U.S.P. 2,658,924 (5.7.50; 10.11.53). S. J. Lukasiewicz and C. J. Plank, assrs to Socony-Vacuum Oil Co. Alcohols are made by contacting olefins of 3–5 carbon atoms with water in the presence of a cat consisting of silica deposited on porous alumina, at a pressure of 375–6000 p.s.i. and at 250°–700° C.

U.S.P. 2,658,930 (22.3.49; 10.11.53). R. B. Thompson, assr to Universal Oil Products Co. Polyhaloalkanes are made by reacting a mono-olefin and a carbon tetrahalide in the presence of finely divided iron, water, and an oxygen-containing gas at 0°–100° C.

U.S.P. 2,658,932 (26.5.51; 10.11.53). G. A. Cohen and C. W. Muessig, assrs to Standard Oil Development Co. Copolymers of propenes and butenes for use in the OXO process are contacted with 60–70% H_2SO_4 at 50°–100° F and then with 70–75% H_2SO_4.

U.S.P. 2,659,659 (7.12.50; 17.11.54). A. J. Schmidl, assr to Standard Oil Development Co. Sulphuric acid sludge is introduced into an excess of liq ammonia at a temp below 125° F and a slurry of ammonium sulphate in unreacted liq ammonia removed from the reaction zone.

U.S.P. 2,659,662–3 (14.11.50; 17.11.53). G. L. Heller, assr to Columbian Carbon Co. Production of carbon black from hydrocarbon fluids.

U.S.P. 2,659,746 (30.6.51; 17.11.53). C. S. Morgan and N. C. Robertson, assrs to Celanese Corpn of America. Soluble bismuth compounds are used as cat for the oxidn of lower aliphatic hydrocarbons with free oxygen.

U.S.P. 2,659,758 (28.6.48; 17.11.53). K. D. Detling and T. Skei, assrs to Shell Development Co. Method of maintaining the activity of cuprous oxide cat in the oxidn of olefins.

U.S.P. 2,660,516 (25.1.50; 24.11.53). G. B. Leyden, assr to Standard Oil Development Co. In the recovery of sulphuric acid from the dilute acid from the absorption of ethylene in sulphuric acid and hydrolysis of the product, *ca* 0·1–1·5 vol % of pine oil is added to the dilute acid to flocculate the carbon which is separated off.

U.S.P. 2,660,521 (18.5.50; 24.11.53). C. F. Teichmann, assr to Texaco Development Corpn. Generation of carbon monoxide and hydrogen by the partial combustion of a fluid hydrocarbon with oxygen in a gas turbine.

U.S.P. 2,660,598 (24.6.47; 24.11.53). F. D. Hoffert, assr to Hydrocarbon Research Inc. In the Fischer–Tropsch process using a fixed bed cat, the interstitial voids in the cat bed are filled with a dense fluid phase of finely divided inert particles to assist heat transfer from the cat to cooling surfaces.

U.S.P. 2,660,599 (Germany 7.5.49; 24.11.53). W. Rottig, assr to Ruhrchemie Akt. Fischer–Tropsch process using an iron cat prepared by precipitation and containing an alkali compound, which cat has been subjected to the action of a reducing gas at 200°–320° C until the free iron content is at least 60% of the total iron content.

U.S.P. 2,660,601 (30.8.48; 24.11.53). N. L. Dickinson, assr to M. W. Kellogg Co. Hydrocarbon waxes are oxidized

with oxygen in the presence of an oxidn cat, the product is solvent extracted to produce an extract phase containing alcohols and a raffinate containing fatty acids, the cat is separated from the raffinate and recycled to the oxidn zone and the fatty acids are isolated from the raffinate.

U.S.P. 2,660,602 (27.4.50; 24.11.53). H. K. Wiese, assr to Standard Oil Development Co. Branched primary alkyl sulphates having 2 more carbon atoms than the starting *tert*-olefin (A) are made by reacting ethylene with A in the presence of 90–98 wt % sulphuric acid at −25° to +80° C at an ethylene partial pressure of 50–1000 p.s.i.g.

U.S.P. 2,670,310 (13.12.46; 23.2.54). M. W. Freeman. Liq for quenching steels comprise oil, water, or an oil–water emulsion containing an organic sulphonate. J. M. S.

Ger.P. 903,577, 24.12.53. Hentrich and Riehen, assrs to DEHYDAG Deutsche Hydrierwerke G.m.b.H., Düsseldorf. Method for producing hydrocarbon sulphonates.

Ger.P. 903,814, 24.12.53. Cramer and Schimmelschmidt, assrs to Farbwerke Hoechst, formerly Meister, Lucius & Brüning, Frankfurt (M)- Hoechst. Method for producing sulphonation products. (Addn. to Pat. 735,096.)

Ger.P. 904,894, 7.1.54. Helberger and Heyden, assrs to Böhme FettChemie G.m.b.H., Düsseldorf. Method for producing sulphonates. (Addn. to Pat. 895,598.)

BrennstChemie, 1954, **35** (3–4). R. T.

COAL, SHALE, AND PEAT

1510. Liquid fuels from oil shale—a critical review. A. C. Rubel. *J. Petrol. Tech.*, Feb. 1954, **6** (2), 9–19.—The oil shale deposits of NW. Colorado contain over 1×10^{11} brl of recoverable oil capable of giving high grade fuel, in addition to gas, sulphur, ammonia, and other products. Pilot plant studies and experimental mining have reached a state at which plant for commercial production could be designed. No discovery costs would be involved, and output rates would be capable of more control than for crude oil.

There are indications that in the immediate future the U.S.A. will be increasingly dependent on crude oil from abroad. Oil from oil shale would give more independence in this respect, particularly in the event of war. Hence it seems to be in the public interest for the oil industry and the Defence Department to co-operate in exploring the possibilities of developing the oil shale industry. G. D. H.

MISCELLANEOUS PRODUCTS

1511. Some applications of statistical methods to exposure trials. Pt II. Design of exposure tests. H. R. Touchin. *J. Oil Col. Chem. Ass.*, May 1954, **37** (407), 248.—Types and sources of error encountered in exposure trials are discussed. Some standard experimental designs, *e.g.* randomized block, factorial and split plot designs, all amenable to statistical analysis, and their application to exposure tests, are described. The number of replicate panels needed and the use of controls are also considered. The method of combining results obtained at different times and from different stations is mentioned. D. K.

1512. Akulon. Anon. *Auto. Engr*, Apr. 1954, **44** (4), 173.—Akulon is the trade name of a nylon type material. 2 grades are available, and a table of properties is given. Akulon is corrosion resistant, light in wt, homogeneous, resilient, fatigue resistant, and has a low coeff of friction and good wearing properties. Production methods and applications of the material are given. T. T.

1513. Patents. U.S.P. 2,659,654 (14.9.50; 17.11.53). J. B. Tuttle, assr to Standard Oil Development Co. Composition for manufacture of sand cores comprising 30–50 wt % drying oil, 15–35 wt % unsaturated clay-filtered polymer of cracked gasoline derivation, and 5–20 wt % mineral oil having a visc of 100–500 S.S.U. at 210° F.

U.S.P. 2,659,677 (15.8.49; 17.11.53). W. A. Schulze, assr to Phillips Petroleum Co. Rubber vulcanizing composition comprising 1 part by wt of a liq polymer of a conjugated diolefin having not more than 6 carbon atoms per mol with 0·3–1 part of rosin acid.

U.S.P. 2,669,526 (30.11.49; 16.2.54). D. F. Koenecke and J. F. McKay, assrs to Standard Oil Development Co. Coating composition comprising an oily siccative diolefin polymer in soln in a hydrocarbon solvent boiling between 60° and 250° C, a finely divided pigment, a heavy metal soap drier, and powdered calcium oxide. J. M. S.

CORROSION

1514. Behaviour of diesel fuel towards zinc. Anon. *Erdöl u. Kohle*, 1953, **6**, 637.—German (draft) standard DIN 51 779. Test for corrosion of galvanized containers. Loss of wt of zinc strip maintained in fuel for 24 hr at 100° C is determined. V. B.

1515. The polarization of electrodes and its utilization for the evaluation of inhibitors. G. Bombara. *Riv. Combust.*, Sept. 1953, **7** (9), 527–46.—Except in the case of direct chemical action, the most general corrosion mechanism is that of the electrochemical attack of a metallic area that is anodic—from the galvanic point of view—towards another. There are numberless causes of electrochemical differentiation of a metallic surface into anodic and cathodic areas. Then the basic element in the study of corrosion is a galvanic cell where the metal concerned is the anode. If an external electric resistance is inserted among the electrodes of the cell and is varied from the infinite value of open circuit down to zero (short circuit), it is possible to draw the polarization curves of the electrodes (electrochemical potential *vs* current). These curves convey, electrochemically, the exact anodic or cathodic behaviour of a metal in all possible conditions of corrosion. By means of polarization curves it is also possible to enhance the effects of inhibitions on the anode and the cathode of the cell where field conditions must be reproduced From the practical standpoint the relative evaluation of inhibitors is simply made by comparison of the corrosion-limiting currents for the same inhibitor percentage. (Author's summary.)

1516. Further Fiat tests on corrosion inhibitors. E. Antinori. *Gas Oil Pwr*, 1954, **49**, 69–72.—The following inhibitors were tested: (1) potassium dichromate + sodium carbonate; (2) sodium dichromate + sodium hydroxide; (3) potassium chromate + sodium nitrite, each at various concn.

With cast-iron in water at room temp and at 80° C there was no corrosion after 30 days, even at the lowest inhibitor concn (0·5%). In water containing 1% sodium chloride rusting occurred at the edges. If the inhibitor concn is increased to 10%, there is no rusting in salt water, even at 80° C.

With cast iron in contact with steel, brass, or aluminium in water, corrosion was obtained in nearly all cases, the cast-iron–steel couple showing the worst effects. An oil containing sulphonic soaps gave good protection to cast iron and steel at room temp, but results at 80° C were poor.

It is concluded that: (*a*) the best inhibitors are those listed above at concn of 2–3%; (*b*) in the presence of chlorides the reduction of rusting is prop to the inhibitor concn; (*c*) these inhibitors are not effective with cast-iron–steel couples, but are suitable with cast iron in contact with brass or aluminium.

The article closes with a short description of chemical tests for chloride concn, chromate concn, and pH (which should be in the range 7·5–9·5). H. C. E.

1517. Cathodic protection of oil tankers. J. Lamb, E. V. Mathias, and W. G. Waite. *Mot. Ship*, Apr. 1954, **35** (409), 30.—This article comprises extracts from a paper, "Cathodic protection of the interior of cargo compartments in oil tankers,"

read at a meeting of the North East Coast Institution of Engineers and Shipbuilders. It is mainly a report of the trials carried out on the Shell tanker *Auris*, from the design of suitable anodes to the saving in repair costs estimated by the use of cathodic protection. U. M.

1518. Patents. U.S.P. 2,658,036 (19.7.50; 3.11.53). C. D. Core and E. N. Jones. Corrosion of oil well equipment is prevented by use of a composition comprising 4–45 wt % of 40% aq soln of an alkali metal arsenite, 4–45 wt % of an alkali metal hexametaphosphate, and a small amount of a surface-active demulsification agent, the balance being water.

U.S.P. 2,658,817 (10.4.50; 10.11.53). A. E. Martin and J. W. Eberman, assrs to Shell Development Co. Corrosion of metals by water is inhibited by adding to the water a material prepared by heating an aq soln of starch containing an acidic hexavalent chromium–oxygen compound, to 50°–100° C.

U.S.P. 2,659,693 (10.5.52; 17.11.53). M. L. Lytle, assr to Standard Oil Development Co. The corrosion of ferrous metals exposed to corrosive soln is prevented by incorporating in the corrosive soln a double, long-chain quaternary ammonium salt of the formula $[RR_2'NANR_2'R]^{++}X_2$, where R is a radical containing an alkyl group of at least 8 carbon atoms or a benzyl group, R′ is a methyl, ethyl, or benzyl group, A is a normal hydrocarbon chain of 4–16 methylene groups or an arylene radical, and X is chlorine, bromine, or iodine. J. M. S.

U.S.P. 2,661,296 (26.4.48; 1.12.53). K. F. Schiermeier and H. A. Poitz, assrs to Shell Development Co. A rust-inhibiting composition of matter consisting essentially of from *ca* 15 to 35% of a petroleum wax, from *ca* 10 to 25% of lead salt of naphthenic acid, the balance being an aromatic solvent. D. A. R.

U.S.P. 2,668,100 (15.11.51; 2.2.54). G. W. Luvisi, assr to National Aluminate Corpn. Corrosion inhibitors for liq hydrocarbons are salicylic acid salts of certain glyoxalidines.

US.P. 2,668,748 (18.12.51; 9.2.54). H. C. Asbury, assr to Phillips Petroleum Co. Corrosion of metals by aq amine soln used to remove acidic materials from gases, is prevented by adding to the soln an extract, pulp, or fibres of a member of the genus *allium* of the lily family. J. M. S.

ENGINES AND AUTOMOTIVE EQUIPMENT

1519. New M.A.N. four-stroke engine. Anon. *Mot. Ship*, Feb. 1954, **34** (407), 486.—A description is given of the current design of M.A.N. four-stroke engine, which is also designed for industrial duty. It is built with from 5 to 10 cyl, and both with and without pressure charging. An unusual feature of the engine is that the aluminium alloy pistons are uncooled. U. M.

1520. The Mitsubishi two-stroke turbocharged engine. Anon. *Mot. Ship*, Apr. 1954, **35** (409), 32.—A Japanese experimental engine is described and illustrated; turbocharging has been applied to a unit first developed in 1932. This engine has 3 cyl of bore 720 mm and stroke 1500 mm, the speed being 115–120 r.p.m. and normal output 3500–3700 b.h.p. There is a centrally placed fuel valve with 3 exhaust valves actuated from a camshaft located at a level of about half the ht of the engine. Engines of this design now being built for installation in ships have an increased dia, of 750 mm, and an output of 11,250 b.h.p. U. M.

1521. An 11,200-b.p.h. engine. Anon. *Mot. Ship*, March 1954, **34** (408), 518.—A 9-cyl turbocharged B. & W. engine designed to develop 11,200 b.h.p. at 115 r.p.m. under normal conditions at sea has recently been completed, and illustrations are given showing the unit on test. It has cyl of 740 mm dia and stroke of 1600 mm, and is to be installed in a tanker; it is the highest-powered marine engine constructed by B. & W. U. M.

1522. M.A.N. diesel. Anon. *Auto. Engr*, Apr. 1954, **44** (4), 138.—A short description of the M.A.N. 630 LI 6-cyl direct injection engine is given. Bore is 112 mm, stroke 140 mm, and the engine develops 130 h.p. at 2000 r.p.m. with a max torque of 376 lb/ft. T. T.

1523. Short air lines on ring diesel engines may cause explosions during gas eruptions. W. Jecht. *Nafta* (*Yugoslavia*), 1954, **5** (2), 51–2.—To avoid explosion hazards with rig diesel engines the air as well as the exhaust line has to be at least 30 m long. Friction losses may be compensated by choosing larger dia—1 inch over normal. (Author's abstract.)

1524. Shell and the gas turbine. Anon. *Gas Oil Pwr*, 1954, **49**, 52, 62.—Outlines the experience that Shell Petroleum Co have had with the gas turbine, and describes future uses to which this machine will be put.

One of the primary advantages of the gas turbine unit is that it is easy to maintain. Since the main engines in a tanker are also used for pumping, maintenance must be reduced to a minimum, and in the *Auris* the only routine attention required is to wash the salt from the compressor and the soot from the heat exchanger. In view of this experience Shell are building a tanker powered by two BTH gas turbine units of nominal rating 5000 h.p. each, designed for runs of the order 1000 hr between servicing. For the *Auris* maintenance costs are given as 0·05 pence/kW hr, and 0·02 pence may be taken as typical for gas turbines. For diesel engines and steam turbines the figures are 0·26 and 0·04 pence/kW hr respectively.

In Venezuela a 12,000-kW gas turbine power station will shortly be in operation. It will be powered by 2 G.E.C. units, one Metropolitan-Vickers unit, and one Dutch unit. H. C. E.

1525. A Japanese marine gas turbine. Anon. *Mot. Ship*, Feb. 1954, **34** (407), 487.—A brief description, with a diagram of the system, is given of a new design of gas turbine developed by the Mitsubishi Nippon Heavy Industries. The experimental unit is designed for an output of 2500 s.h.p., max gas inlet temp of 700° C, and revolution speed of driving turbine 8000 r.p.m. Estimated thermal efficiency attained will be 31%. U. M.

1526. The gas turbine at sea. Anon. *Mot. Ship*, Feb. 1954, **34** (407), 497.—An extract is given of the written discussions and authors' reply to the Lamb and Duggan paper on the performance of the *Auris*. U. M.

1527. Exhaust-gas turbocharging. Anon. *Mot. Ship*, March 1954, **34** (408), 544.—This article discusses a monograph by Dr A. J. Buchi—"Exhaust turbocharging of internal combustion engines: its origin, evolution, present state of development, and future potentialities"—which has been published under the auspices of the Franklin Institute, U.S.A. U. M.

1528. 1700-b.h.p. Sirron turbocharged engine. Anon. *Mot. Ship*, Apr. 1954, **35** (409), 36.—The highest-powered Sirron engine yet built by the Newbury Diesel Co, an exhaust-gas turbocharged loop-scavenged 2-stroke unit, is undergoing extensive shop trials, and is to be installed in June in a cargo ship. The engine is of the company's P type, and is a 6-cyl unit of bore 407 mm and stroke 648 mm, and output of 1700 b.h.p. U. M.

1529. Fuel systems by Lucas. Anon. *Aeroplane*, 28.5.54, **86** (2236), 677.—A description is given of the work of the fuel systems division of Joseph Lucas (Gas Turbine Equipment) Ltd, which includes the design and development of pumps, control systems, barometric pressure control, flow and temp control, and afterburning and fuel supply. U. M.

1530. Influence of flying altitude on mixture preparation and combustion. E. Sanger. *BrennstChemie*, 1954, **38** (3–4), 41–4.—A study of the gas and reaction kinetics of combustion in aeroplane engines at high altitudes in relation to decreasing density and temp is presented. Unsatisfactory functioning of a combustion chamber at high altitudes—otherwise satisfactory at low levels—is attributable to defective combustion, i.e. slower vaporization of the drops and too slow combustion. Drop vaporization is accelerated by conducting the fuel drops carefully through the zones of intensive chemical reactions, to utilize the luminescence radiation fully. By choice of low-boiling fuels or preheating the fuel, visc and capillary const, and thereby drop size are reduced. The size of the drops is decreased by increasing injection over pressures. Combustion is improved by using fuel with lower heat of vaporization, lower capillary const, lower fl. pt. Choice of a fuel with lower ignition temp and higher Cetane No., or addition of reaction accelerators can accelerate too slow combustion slightly. R. T.

1531. Patents. U.S.P. 2,660,544 (22.9.51; 24.11.53). R. J. Rieckhoff, assr to Sinclair Refining Co. Lead compounds deposited on spark plugs are removed by washing the plugs in a hot aq soln of ammonium citrate.

U.S.P. 2,660,678 (8.2.51; 24.11.53). H. W. Sigworth and B. A. Fries, assrs to California Research Corpn. Device for measuring deposits formed in combustion chambers of I.C. engines.

U.S.P. 2,669,869 (21.9.49; 23.2.54). M. W. Weber, assr in part to H. W. Link. Apparatus for gauging consumption of oil by an I.C. engine.

U.S.P. 2,670,082 (23.11.49; 23.2.54). R. G. Dunn and R. F. Heiser. Apparatus for de-icing aircraft fuel filters including power driven means for injecting an anti-freeze liq into the fuel line upstream of the filter, which means is automatically controlled by the pressure in the fuel line downstream of the filter. J. M. S.

MISCELLANEOUS

1532. Paint in the petroleum industry. H. B. Footner. *J. Inst. Petrol.*, 1954, **40**, 65–9.—The applications of paint for the maintenance and decoration of petroleum equipment and the control of the quality used are discussed briefly. A. R. W. B.

1533. Value of a barrel of crude oil. W. S. Eggleston and C. R. McEwen. *J. Petrol. Tech.*, Jan. 1954, **6** (1), 11.—The gross income per brl of crude is the posted price in the field, plus the value of any associated gas and gasoline. The costs to be set against this income include royalty, land costs, costs of geological and geophysical work, depreciation of equipment, etc, production costs, manufacturing costs, mineral taxes, and overheads. The operating income is the difference between the gross income and the total operating costs, and is not true profit, for income tax and exploration costs must be deducted. Furthermore, a discount factor has to be applied to find the present worth of oil to be produced at some future date. G. D. H.

1534. International Conference on Oil Pollution of the Sea. Anon. *Petrol. Times*, **58** (1482), 505.—A summary is given of the resolutions of the International conference of the major countries on the subject of marine pollution by oil, April–May 1954.

The convention contains 21 articles and 2 annexes; lists prohibited zones; and 8 resolutions were adopted. G. A. C.

1535. New type of slide rule for the petroleum industry. F. Schmeling. *Erdöl u. Kohle*, 1953, **6**, 632, 637.—In addition to normal slide rule scales, which include markings corresponding to reciprocals of conversion factors from metric to U.S.–U.K. units, and analytical factors, special scales applicable to petroleum are included: API-d_{15}, temp correction for (log log $\nu + 0{\cdot}8$), lub oil blending, etc. V. B.

1536. Programme-governed calculating machines and their introduction into the petroleum industry. B. Thüring. *Erdöl u. Kohle*, 1954, **7**, 230–1.—Brief description of German (Leitz) "Z.5" calculator; relay-type embodying 2400 relays, addition takes 0·1 sec, division 0·8 sec. Type of problems which machine can handle (*e.g.* calculation of fract columns) and procedure employed are indicated. V. B.

1537. The Presidential Address 1954. Energy for Britain—the decades ahead. W. I. Jones. *J. Inst. Fuel*, May 1954, **27** (160), 219.—The various fuel and energy resources in Britain are considered with the purpose of determining whether these resources are great enough to meet growing requirements. It is shown that peat, oil, hydro-electric power, and nuclear power can make valuable contributions, but coal is still likely to be the main source of heat and power for many generations. Increase in efficiency of the use of coal with a view to obtaining further economies is also discussed. The author believes that with hard work, care, efficiency and extensive capital expenditure, Britain should be able to produce all the power necessary to meet the production needs of the next 100 years. 9 literature refs. D. K.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1538. Petroleum geology and developments in 1951–52. A. E. Gunther. *Inst. Petrol. Rev.*, 1954, **8** (86), 21–6.—Crude oil production continued to increase during this period, being spurred on by the rearmament programme, by nearly 20% in the 2 years. Developments in Persia, which stopped production there, gave rise to even greater production in other Middle Eastern areas. Further discoveries were made in Canada. Full details are given of the geophysical prospecting which took place in different areas. Drilling activity is also analysed. The article also covers such aspects as reserves, pipelines, and oil law, and concludes with a chronological survey from 1945 to 1952. R. H.

1539. Subsurface interpretation of intersecting faults and their effects upon stratigraphic horizons. G. Dickinson. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 854.—The author, who has been teaching subsurface geological methods to graduate geologists, explains in this paper the methods used for illustrating intersecting faults and their effects on stratigraphic horizons, and points out some of the unexpected results obtained in these hypothetical combinations, with the aid of diagrams. E. N. T.

1540. Fractures induced during drilling. C. Pendexter and R. E. Rohn. *J. Petrol. Tech.*, March 1954, **6** (3), 15, 49.—Fractures formed in cores during drilling have no mineralization or hydrocarbon residue on the surfaces; they fit perfectly without overlap; often they curve downwards into the centre of the core, and may split it into 2 equal halves; sometimes the bottom is at a lithological change.

Fractures may form during coring, or ahead of the bit. G. D. H.

1541. Differential entrapment of oil and gas: a fundamental principle. W. C. Gussow. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 816.—The principle of differential entrapment is outlined in this paper as an explanation of the so-called anomalous occurrences of oil and gas in contiguous structures, and the more important factors which modify accumulations of hydrocarbons are listed and discussed.

This principle is described using the Bonnie Glen–Wizard Lake reef trend of Alberta, Canada, as an example. Relationships in the Persian fields are mentioned briefly, and a new explanation of the synclinal occurrence of oil is presented.

5 new concepts are introduced, namely: (1) hydrocarbons move along definite migration paths; (2) they migrate as streams or rivulets; (3) traps along these paths will be filled with oil and/or gas, and those not on the path of migration remain loaded with salt water; (4) oil-filled traps are still effective gas traps, but gas-filled traps are not effective oil traps; (5) regional or distant migration is believed essential for commercial accumulations of hydrocarbons. E. N. T.

1542. Texas basement rocks: a progress report. P. T. Flawn. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 900.—The author, who has been engaged since 1951 in a study of basement rocks in Texas and SE. New Mexico, presents a brief report on the picture of the basement that has emerged to date.

The basement in this area can now be subdivided into the following 7 parts: (1) a central stable area, mostly granitic rocks (the Texas craton); (2) the Van Horn mobile belt—a prism of deformed and metamorphosed sedimentary and igneous rocks that borders the craton on the SW; (3) the Red River mobile belt—composed predominantly of metasedimentary rocks and probably marginal to the craton; (4) the Fisher metasedimentary arc—an arcuate belt of low-grade metasedimentary rocks; (5) the Panhandle volcanic terrain—an extensive area of volcanic rocks, chiefly underformed flows of rhyolite porphyry, that underlies a large part of the Panhandle and south plains of Texas and extends west into New Mexico; (6) the Swisher gabbroic terrain—an area of gabbro and diabase comprising the basement beneath part of the south plains of Texas; (7) the Wichita igneous province, which includes Precambrian rocks exposed in the Arbuckle and Wichita mountains of Oklahoma. E. N. T.

1543. Tectonic and paleogeographic inferences from low-dip unconformities. W. F. Tanner. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 886.—Based on field and air photo studies, this paper explains the tracing of the Vamoosa–Pawhuska contact southward from Okfuskee County, and the determination of Ada–Pawhuska relationships within the area, and gives new data which have been collected for the correlation of sediments of Virgil age.

The truncation of the Vamoosa and other formations by the Ada permits field examination of an important middle Virgil unconformity, and analysis of this feature and similar unconformities elsewhere in the section yields a history of long-term orogeny in the Hunton arch area, and suggests a post-Pennsylvanian date for Ouachita orogeny. E. N. T.

1544. Tectonic relations of North and South America. A. J. Eardley. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 707.—The author presents a study of the tectonics of the mediterranean region between North and South America. The Paleozoic belts of orogeny along the Atlantic and Pacific margins of North America are considered in relation to a possible Paleozoic belt of orogeny in South America, and some speculative conclusions are reached about their junction area and their position through Central America, Gulf of Mexico, and Caribbean regions.

Conclusions are drawn as to the position of ancient tectogenes which the Jurassic and Cretaceous belts of orogeny are believed to indicate, and the active belts of orogeny in the Lesser Antilles and along the Pacific coast are reviewed, where foredeeps mark zones of active seismicity.

A theory of origin of the belts of orogeny, basins, trenches, geanticlines, and volcanic arcs is proposed, which involves asymmetrical convective flow in the mantle as the causative mechanism. E. N. T.

1545. Raton—frontier exploration in action. F. J. Gardner. *Oil Gas J.*, 5.4.54, **52** (48), 165.—Oil prospects of the Raton Basin, which crosses the New Mexico–Colorado border, are described. The basin is *ca* 65 miles wide and 160 miles in length, and lies between the Sangre de Cristo Mts on the west and the Sierra Grande Uplift to the east. It contains approx 20,000 ft of Palaeozoic and Mesozoic rocks, of which Pennsylvanian and Cretaceous limestones and sandstones offer the best prospects. Surface beds are Tertiary up to 1000 ft thick.

Numerous subsurface folds flanking the Sangre de Cristo foothills are probable, but these may have been flushed by surface waters; stratigraphical traps may also be expected on the margin and in the centre of the basin due to rapid facies changes and overlap. Best prospects are on the eastern flank, where Permian lies on basement and is overlapped by younger rocks.

The basin is shortly to be explored by deep tests. C. A. F.

1546. Revision of Devonian and Carboniferous sections, Nopah range, Inyo County, California. J. C. Hazzard. *Bull., Amer. Ass. Petrol. Geol.*, 1954, **38**, 878.—This review is based on the stratigraphic descriptions of the area given by the author in 1937.

The position of the Devonian–Mississippian boundary has been established; a more definite correlation with the section as described in the Good Springs, Nevada, region by Hewett is allowed; and it is shown that the name "Stewart Valley limestone" should be dropped and the formation names recognized by Hewett in the Good Springs area be applied to units of the Devonian and Carboniferous parts of the Nopah section. E. N. T.

1547. Wildcat completed. Anon. *Oil Gas J.*, 12.4.54, **52** (49), 100.—A wildcat 5 miles west of Fillmore, California, was completed for over 500 b.d. of 27° oil from Pliocene sand perforated from 14,170–14,235 ft. The well is about 15 miles NE. of Ventura Avenue. C. A. F.

1548. Oil in Canada. J. Flandrin. *Rev. Inst. franç. Pétrole*, Apr. 1954, **9** (4), 154–73.—The history of oil development in Canada is briefly reviewed, and this is followed by a short account of the main geological features. The oilfields of Eastern Canada are briefly described, but the main consideration is given to Western Canada, there being descriptions of the stratigraphy, structural elements, and of some of the principal oilfields. There is a brief account of the methods of search for oil, and short notes on reserves and production. G. D. H.

1549. Fractured reservoirs of Middle East. E. J. Daniel. *Bull. Amer. Ass. Petrol. Geol.*, 1954, **38**, 774.—This paper describes the location, structure, and stratigraphy of 3 oilfields in the Middle East (Ain Zalah and Kirkuk in Iraq, and Dukhan in the Persian Gulf), showing the very different roles played by formation fractures in the holding and producing of oil.

In the Ain Zalah field the reservoir rock is extremely tight, and it has a little porosity but practically no permeability. Kirkuk has a high average porosity but a more varied permeability, which depends directly on stratigraphy. The reservoir limestone, which, stratigraphically and lithologically, is very complex, is faulted and intensively fractured and jointed, giving high, continuously sustained production.

Some jointing exists in the Dukhan field, where the limestones are moderately to highly porous and permeable. E. N. T.

1550. German producer flows. Anon. *Oil Gas J.*, 5.4.54, **52** (48), 78.—Schmedenstedt 2, an exploration well near Peine in W. Germany, was completed as a flower from Dogger Beta sand at *ca* 2830 ft. The well is on the NE. flank of the Oberg structure.

Bockstedt 2, a wildcat approx 20 miles SW. of Bremen, tested 13 brl/hr from the Lower Cretaceous Valendis at 3878–3907 ft. C. A. F.

1551. French discovery. Anon. *Oil Gas J.*, 5.4.54, **52** (48), 78.—The Parentis test, *ca* 44 miles SW. of Bordeaux, found 1000 ft of gas-cut oil on a test at approx 7400 ft in questionable Lower Cretaceous. Further tests are planned.

The well is *ca* 80 miles NW. of the Lacq field, and is on a structure outlined by geophysical methods. C. A. F.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1552. The European Association of Exploration Geophysicists. Paris meeting, May 1953. J. McG. Bruckshaw. *Petroleum, Lond.*, Dec. 1953, **16** (12), 353.—Presidential address discusses interpretation of gravity data, and modern methods of assessing significance of survey results are critically examined. Summaries of the papers read are given—degree of certainty in geophysical prospecting, magnetic prospecting, aspects of seismic prospecting, application of the Schlumberger well-logging in the search for minerals, and explosives in seismic prospectings. G. H. G.

1553. Patents. U.S.P. 2,665,237 (8.5.50; 5.1.54). R. J. Strawinski, assr to Texaco Development Corpn. Method of prospecting for petroleum deposits characterized by discharge of hydrocarbon gas in the earth surface due to activity of micro-organisms, which comprises incubating soil samples with an inorganic salt nutrient, air, and an aliphatic hydrocarbon, and measuring the rate at which the hydrocarbon is consumed.

U.S.P. 2,667,444 (8.4.49; 26.1.54). D. M. Updegraff and H. H. Chase, assrs to Socony-Vacuum Oil Co. Microbiological method of prospecting in which earth samples are mixed with an aq inorganic salt medium and a petroleum hydrocarbon nutrient, and the time taken for the nutrient to be consumed by the bacteria present is taken as a measure of the number of bacteria. V. P. P.

DRILLING

1554. When is it practicable to drill with air and gas? L. S. Fuller. *Oil Gas J.*, 5.4.54, **52** (48), 110.—Wells have been drilled to over 9000 ft using gas or air as circulating media,

and experimental operations have shown that these are excellent media when proper equipment and conditions exist.

These operations are particularly applicable to 4 main conditions: (1) drilling of surface beds, where lost circulation is a big problem; (2) re-drilling old wells, where there is low formation pressure; (3) drilling low pressure gas sands to prevent contamination; and (4) drilling in areas, where water is scarce or where penetration rates are improved by air drilling.

Successful gas drilling has been carried out in the San Juan Basin in NW. New Mexico, involving much saving of time and reduction of fishing jobs.

Satisfactory results have been obtained by using pressures ranging from 80 to 450 p.s.i; higher presures drill more efficiently. The piping set-up as used in the San Juan Basin is briefly described and the hazards of drilling with gas indicated. C. A. F.

1555. Moving a medium-powered 7000-ft. drilling outfit. J. Walter and C. Lorin de Reure. *Bull. Ass. franç. Tech. Pétrole.*, Jan. 1954, 41–60.—The transport facilities, the equipment to be moved, and the operations involved in moving a drilling outfit are briefly described. A particular case is given, and times and costs are discussed. G. D. H.

1556. Mechanical treatment of weighted drilling muds. R. A. Bobo and R. S. Hoch. *J. Petrol. Tech.*, Apr. 1954, **6** (4), AIMME Tech. Paper No. 3782, 39–42.—The accumulation of fine drilled solids in mud creates numerous problems, and may cause wastage of weighting materials, with consequent increased costs. In order to overcome this a slightly tapered centrifuge bowl, containing a spiral conveyor to transfer the peripheral material, has been used. By suitable selection of speed of rotation clay material can be removed with little loss of barytes. By this means the amount of chemical treatment needed is reduced. Muds can be reclaimed and concentrated to densities of up to 24 lb/gal. The visc reduction arising from centrifuging allows easier sand settling in the pits, and much of the active lime in a treated mud may also be removed by the centrifuge. Properly installed and supervised, the centrifuge requires little maintenance and attention.
G. D. H.

1557. Drilling mud control in the southwest Louisiana coastal area. C. R. Claus and G. A. Standish. *J. Petrol. Tech.*, Apr. 1954 **6** (4), AIMME Tech. Paper No. 3783, 33–8.—39 wells have been drilled by Magnolia Petroleum Co in a small area of SW. coastal Louisiana since March 1945. Depths averaged 10,977 ft, with the maximum 13,518 ft, while mud costs ranged $8700–165,000 and overall drilling costs $74,000–543,000 per well. High pressure zones, sloughing, and unconsolidated beds required careful control of mud weight, filtrate, visc, and gel strength. Careful design of casing programme and mud was essential for economic success. The various types of mud used include phosphate, red lime (late conversion), red lime starch (early conversion), red lime starch, oil emulsion (normally not over 10% diesel oil), low alkalinity–low lime content, and gel muds for completion. Costs, materials used, and drilling rates are given for certain cases.

The treatment reduced risks, gave more rapid penetration, and better completions. G. D. H.

1558. Inexpensive mud for deep wells. H. F. Coffer and R. C. Clark. *J. Petrol. Tech.*, May 1954, **6** (5), 10–14.—A series of laboratory tests were made on a 6% slurry of Wyoming bentonite with 5 lb/brl of lime, and varying amounts of NaOH. Quebracho, tannin, and calcium ligno-sulphate all reduced the visc. From these tests it was concluded that for a mud with low NaOH content the most efficient thinner for use in a lime system is calcium ligno-sulphate. A laboratory mix with 2 lb/brl of liquox, 2 lb/brl of lime, and 0·2 lb/brl of NaOH was made. The resistivity was 2·6 ohm-meters; the mud would tolerate gypsum, anhydrite, or cement, and 50,000–75,000 p.p.m. of salt. The mud did not gel on prolonged heating at 350° F. This mud was tested in the field on a 10,630-ft well near Abbeville. Mud and chemical costs were $4,396, being $\frac{2}{3}$ to $\frac{1}{2}$ the cost in comparable wells using other muds. Satisfactory tests were also made in Canada, including the addition of starch to give a water loss of 2·6–3·4 cc instead of 10–12 cc. The mud was very satisfactory in a difficult case of sloughing shale. The mud can be weighted to 19·5 lb/gal.
G. D. H.

1559. Oil well logging by simplified differential thermal analysis. J. J. Glogoczowski. *Nafta* (*Krakow*), 1953, **9**, 240–3.—Clays from Krosno area cannot be identified without geochemical investigation by Geoanalytical Establishment of the (Polish) IP. The work includes the simplified thermal analysis based on the principles of J. D. Syedletski and P. S. Samodurov and researches of R. E. Grim and F. H. Bailly. A comparison between geochemical, fossil, and thermal analyses shows that the simplified method limited in range to 500° C suffers in accuracy but is often adequate in cases of particularly uncomplicated clays. Otherwise 1000° C range analysis is required. M. S.

1560. Patents. U.S.P. 2,665,115 (13.2.50; 5.1.54). R. Bassinger. Well percussion tool.

U.S.P. 2,665,149 (29.3.49; 5.1.54). B. F. Schmidt. Hydraulic drilling lift and packer therefor.

U.S.P. 2,665,164 (27.1.49; 5.1.54). F. J. Spang, assr to. Spang and Co. Well fishing tool.

U.S.P. 2,664,976 (20.11.52; 5.1.54). H. J. Woolslayer, C. Jenkins, C. D. Iddings, and E. A. Campbell, assrs to Lee C. Moore Corpn. Portable well servicing equipment.

U.S.P. 2,665,762 (28.8.51; 12.1.54). W. S. Althouse, assr to Baker Oil Tools Inc. Casing centring device.

U.S.P. 2,665,763 (23.4.48; 12.1.54). R. C. Baker, assr to Baker Oil Tools Inc. Well packer apparatus.

U.S.P. 2,665,764 (6.1.50; 12.1.54). R. C. Baker, assr to Baker Oil Tools Inc. Retrievable subsurface well tool.

U.S.P. 2,665,765 (3.4.50; 12.1.54). R. C. Baker, assr to Baker Oil Tools Inc. Segmental slip subsurface well tool.

U.S.P. 2,665,766 (3.10.49; 12.1.54). V. S. Harlin. Pipe-cleaning tool.

U.S.P. 2,665,767 (10.3.52; 12.1.54). J. M. Green. Device for removing quicksand, silt, or the like from wells.

U.S.P. 2,665,885 (25.10.48; 12.1.54). J. R. Gignoux, assr to Shell Development Co. Apparatus for offshore coring.

U.S.P. 2,665,886 (20.9.50; 12.1.54). W. H. Ellis. Method and apparatus for drilling wells.

U.S.P. 2,665,887 (3.8.51; 12.1.54). L. L. Shelton, assr to Houston Oil Field Material Co. Combination jar and key seat reamer for engaging and enlarging key seats formed in well bores by a string of pipe.

U.S.P. 2,665,888 (10.5.48; 12.1.54). R. M. Claypool and D. M. Best, assrs to Houston Oil Field Material Co. Device for unscrewing pipe.

U.S.P. 2,666,142 (28.3.50; 12.1.54). G. Herzog and K. C. ten Brink, assrs to Texas Co. Testing neutron borehole logging instruments responding to variations in H_2-content of formations.

U.S.P. 2,666,146 (17.3.50; 12.1.54). G. Herzog, assr to Texas Co. Borehole logging by bombarding the formations with neutrons to produce γ-rays which produce electric impulses which are recorded.

U.S.P. 2,666,620 (29.5.48; 19.1.54). H. J. Welge and R. C. West, assrs to Standard Oil Development Co. Unaltered core samples are obtained by injecting into a stratum S to be tested a thermoplastic material T of m.p. 15°–25° F at 20°–40° F above its m.p., hardening T in S, cutting a sample of S embedded in T, and then removing T.

U.S.P. 2,666,621 (22.3.51; 19.1.54). G. R. Hunt. Wiper for rhembers operating in wells.

U.S.P. 2,666,622 (29.12.47; 19.1.54). H. J. Hawthorne Detachable blade rotary drilling bit.

U.S.P. 2,667,144 (21.11.49; 26.1.54). S. Evans, assr to Hughes Tool Co. Rotary and impact tool.

U.S.P. 2,667,332 (31.3.52; 26.1.54). J. S. McCune and W. E. Hanks, assrs to Oilwell Drain Hole Drilling Co. Flexible shaft well drilling equipment.

U.S.P. 2,667,334 (3.3.51; 26.1.54). J. E. Ortloff, assr to Standard Oil Development Co. Full hole diamond bit.

U.S.P. 2,666,032 (11.4.52; 12.1.54). W. J. Weiss, assr to Texas Co. Drilling mud comprising a hydratable alkaline earth metal clay dispersed in water and $<1\%$ of a visc reducing material obtained by treating pectin with hot alkali until calcium insensitive. V. P. P.

PRODUCTION

1561. Trends in drillable acreage. G. R. Hopkins. *J. Petrol. Tech.*, Apr. 1954, **6** (4), 20–3.—Reserves of 10–15 years ago were estimated on an extremely conservative basis, as is indicated by the extensive "revisions" added to reserves in the past 8 years. The majority of these revisions are not real discoveries, although they represent future production. Interest is now being focused on drillable acreage.

Examination of statistics for 1946–51 shows that for the U.S.A. the net increase in reserves over the period, omitting revisions, is only 400,000,000 brl, while for California and Pennsylvania, on the same basis, there are deficits of 1,072,000,000 and 73,000,000 brl, respectively. All revisions based on technology and economics are not positive, and therefore do not always mean more locations.

On an average in the U.S.A. the reserve per new producing well needs to be at least 100,000 brl to give a profit. On this basis the 211,000 wells (excluding gas wells) drilled during the 6 years was 90,000 above the figure indicated by the new reserves. The position is markedly affected by close drilling in old fields.

Comparison of 40 of the largest fields found in 1936 with 40 found in 1946 shows after 5 years decidedly less total acreage and more acres/well for the second group, suggesting that the newer discoveries were smaller.

In Arkansas in recent years there has been a decline in the annual number of surface acres added, and the surface spacing factor has also declined. G. D. H.

1562. Oil production after breakthrough as influenced by mobility ratio. A. B. Dyes, B. H. Caudle, and R. A. Erickson. *J. Petrol. Tech.*, Apr. 1954, **6** (4), AIMME Tech. Paper No. 3784, 27–32.—The influence of fluid mobilities on the sweep-out pattern has been extended to cover the phase which follows breakthrough of the injected material. X-ray shadowgraph technique was used on porous alundum plates, with miscible oil phases of different visc. From the X-ray pictures flowing ratios at the producing well and cumulative vol injected were calculated. Mobility ratios ranged 0·1–17, and 5-spot, staggered, and direct line drive patterns were studied.

Over a wide range of mobility ratios often as much as 50% of the ultimate oil recovery is apparently obtained after breakthrough. Although high ultimate sweepouts are attainable for most practicable mobility ratios, the rate of recovery and the amount of fluid to be injected may cause high ratios to be favoured in practice. Production after breakthrough must be included for satisfactory comparisons.

The application of the data to a 5-spot field flood is described. G. D. H.

1563. Displacement experiments in a consolidated porous system. J. S. Levine. *J. Petrol. Tech.*, March 1954, **6** (3), AIMME Tech. Paper No. 3759, 21–30.—4 displacement experiments have been made on an alundum core 53·9 cm long and *ca* 6 cm dia. Flow potential distributions in each phase were measured through oil-wet and water-wet capillary barriers, using a null-point pressure balance. Saturation was measured electrically. The effective and relative permeabilities for each phase have been calculated for the transient displacement process, for oil displacing water and water displacing oil. The relative permeability depended on the direction of saturation change, and was not a unique function of displaced phase saturation. For the conditions used relative permeability seemed independent of visc. Values of dynamic capillary pressure have been calculated, and breakthrough recovery, as calculated by the Buckley–Leverett fractional flow equation, agrees reasonably well with observation. G. D. H.

1564. The determination of porosity of sedimentary rocks. I. Orsic. *Nafta* (*Yugoslavia*), 1954, **5** (3), 70–5.—The paper outlines the role of porosity in estimating oil and gas reserves and discusses several methods for the determination of the parameter. Investigations carried out at the Institute showed that the Rall–Taliaferro method gives very reliable results, while the Washburn–Burting method was found unsatisfactory. Control tests were made by the U.S. Bureau of Mines Petroleum Equipment Station in Bartlesville, Oklahoma, and L'Institut français du Pétrole in Paris. Results obtained from the first checked very closely with the authors, while the second method (IFP 1949) gave somewhat lower results. The Rall–Taliaferro method is proposed to the domestic petroleum industry as a standard method for the determination of porosity. (Author's abstract.)

1565. Corrosion–metallurgical aspects of sucker rods and their oil well service performance. F. J. Radd and R. L. McGlasson. *J. Petrol. Tech.*, March 1954, **6** (3), AIMME Tech. Paper No. 3758, 37–44.—The mechanisms of corrosion and corrosion fatigue damage to sucker rods are examined from the electrochemical point of view. The corrosion fatigue life is sensitive to carbide content and distribution. The built-in micro-electrolytic cells resulting from micro-structural variations are ample under certain conditions to give corrosion or corrosion fatigue. The same iron carbide potentials are important even in normal rusting.

Where rod wear is not a problem and where corrosive service is encountered the lower carbon alloy steels of suitable yield strengths and quenched or tempered structures would seem preferable. When wear is significant plain carbon and carbon–manganese rods should contribute to increased corrosion fatigue life. G. D. H.

1566. Equilibrium vaporization ratios for a reservoir fluid containing a high concentration of H_2S. H. Vagtborg. *J. Petrol. Tech.*, March 1954, **6** (3), AIMME Tech. Paper No. 3760, 31–6.—Equilibrium vaporization ratios were obtained for system of light hydrocarbons, N_2, CO_2, and H_2S in a reservoir fluid with 35 mol % H_2S, for the range 700–2500 p.s.i.a. at 154° F. P.V.T. studies were made on the reservoir fluid, including flash and differential (500 p.s.i. steps) liberation of the dissolved gas. Special apparatus was used to prevent the H_2S attacking the mercury in the cell. When large amounts of H_2S are present the equilibrium vaporization ratios for ethane and higher hydrocarbons are greater than for systems with little or no H_2S: the reverse is the case for methane. It is evident that the use of published correlations on the physical properties of reservoir fluids can lead to large errors if applied to systems with large amount of H_2S. G. D. H.

1567. Blotter-type electrolytic model determination of areal sweeps in oil recovery by *in situ* combustion. H. J. Ramey and G. W. Nabor. *J. Petrol. Tech.*, May 1954, **6** (5), AIMME Tech. Paper No. 3798, 35–9.—A blotter-type electrolytic model was used to prepare flow diagrams for a field test of the *in situ* combustion process. The areal sweep of a combustion pattern is similar to the sweep patterns which would be developed at an infinite mobility ratio, for such a ratio obtains approximately across a combustion front, because of the complete removal of liq from the sand behind.

The blotter-type model does not give as much information as more elaborate and costly potentiometric models, but is speedier in operation, easy to construct, and comparisons have shown that the results are satisfactory. Sweep efficiencies

for various mobility ratios, well patterns, and determined by different methods are tabulated. G. D. H.

1568. Development of an underground heat wave for oil recovery. B. F. Grant and S. E. Szasz. *J. Petrol. Tech.*, May 1954, **6** (5), AIMME Tech. Paper No. 3797, 23–33.—Field experiments are described in which a combustion-supported heat wave was created and propagated through an oil-bearing reservoir rock. The reservoir was *ca* 600 ft deep, and averaged 30 ft thickness. It had been depleted by primary production and gas injection to the extent of 25%, but still had 660 brl/acre-ft. The methods used to maintain wave continuity and temp are described, and the experiments were continued for a considerable period. The peak temp was *ca* 1000° F, and the formation behind the high temp zone was practically stripped of oil. Combustion took place in the formation. It appears that most of the oil is moved by the very front of the wave before the ignition temp are reached, and so should be recoverable.

Diagrams show core data, production history, the composition of injected and produced gas, rate of oxygen injection and consumption, cumulative oxygen injected and heat generated, oil production rates, and gas–oil ratios for the experimental well pattern. G. D. H.

1569. Dual pumping with five strings of tubing. F. C. Edwards. *J. Petrol. Tech.*, May 1954, **6** (5), 15–17.—Dual zone pumping using conventional equipment permits the separate and independent pumping of each zone through a single well. Separate gas relief is provided for each zone. The nature of the equipment and its installation are described. In the well discussed the shallow zone was at 5900 ft, and the deep zone at *ca* 6500 ft. 2 sets of 2-inch tubing were installed with a special cross-over shoe having a retainer production packer below to separate the 2 zones. Gas from the lower horizon was vented through 1-inch pipe. Hydraulic pumps were installed in both 2-inch strings, using ¾-inch tubing. G. D. H.

1570. Effect of surface and interfacial tensions on recovery of oil by water flooding. H. T. Kennedy and E. T. Guerrero. *J. Petrol. Tech.*, May 1954, **6** (5), AIMME Tech. Paper No. 3796, 41–8.—14 surface-active agents found to be effective in lowering the surface and interfacial tensions were tested for the extent of their adsorption by Woodbine sand cores. In all cases adsorption was sufficient to preclude any substantial concn of the chemical at the flood front. Hence before each flood test the system was brought to equilibrium with definite concn in the flood water. Various concn of 6 of the chemicals were used, with and without gas in the core along with oil. Lowering the interfacial tension between oil and brine slightly reduced oil recovery by flooding above the bubble point, but the effect was small or negligible below the bubble point, except that the gas independently has a beneficial effect on recovery.

The data have no known relation to the results obtainable by full-scale water floods with these chemicals, but should be helpful in predicting the performance of surface-active chemicals which are not lost by adsorption, if such can be found. G. D. H.

1571. Case history—unitization and water and gas injection, Hackberry field, Louisiana. R. L. Evans and A. E. Barry. *Oil Gas J.*, 5.4.54, **52** (48), 112.—The pressure maintenance projects introduced in 1945 and 1950 in the Hackberry field, Louisiana, are described.

The structure of the field is a piercement salt dome with 2 domal features forming East and West Hackberry. Pressure maintenance is carried out in West Hackberry, a unitized area, which has a productive area of 232 acres on the NW. flank of the dome. There are 3 main productive sands: the Oligocene Camerina B, C, and D, each having dips of approx 60°. The D is the most important with an average thickness of 95 ft and max closure of 1900 ft between 8100 and 10,000 ft. This sand producing under water injection, started in 1945 with an initial injection rate of 1500 b.d.

The B sand has an average thickness of 49 ft with a productive closure of 1100 ft between 8000 and 9100 ft; this produces under gas injection started in 1950.

An outline of the field operations is given. C. A. F.

1572. Pressure maintenance by gas injection in the Brookhaven field, Mississippi. J. B. Justus, R. W. Cassingham, and C. R. Blomberg. *J. Petrol. Tech.*, Apr. 1954, **6** (4), AIMME Tech. Paper No. 3781, 43–53.—Brookhaven produces from erratic Basal Tuscaloosa sandstones, on a faulted dome at depths of *ca* 10,300 ft. Permeability ranges 0–6000 mD, and averages 256 mD; the porosity is about 25%, and interstitial water averages 45%. The undersaturated reservoir fluid varies in gravity and observed saturation pressures range 733–2255 p.s.i. Before the institution of pressure maintenance, reservoir pressure had fallen almost to half of the original value, for the recovery of 4·5% of the oil originally in place. Pressure has been kept at 2750 p.s.i., and oil recovery is now 17% of the oil in place.

The field performance is analysed, and the expected ultimate recovery (29%) is compared with that predicted by natural depletion (21%). Production costs are lower than for a nearby similar Basal Tuscaloosa reservoir. G. D. H.

1573. Petroleum-engineering study of Flat Rock oilfield, Osage County, Oklahoma. C. H. Riggs, J. E. West, and J. V. Maude. *Rep. Invest. U.S. Bur. Min.* 5081, Jan. 1954.—The Flat Rock field in the SE. corner of Osage Co, approx 6 miles NW. of Tulsa, Oklahoma, was discovered in Nov. 1904. This report describes the geology, reviews the production history, and gives estimates of the remaining oil reserves. Because most of the production has been obtained from the Bartlesville sand and because the remaining reserves are confined almost entirely to this formation, emphasis is placed on this reservoir. The study covers the nature of the water production, the possibilities of contamination by extraneous waters, and the relation of water injection in oil recovery from the sand. Production behaviour of the field and certain leases are interpreted, and records of injected gas and/or water are studied to determine what effect the injection of these fluids would have on oil recovery from the sand. Other reservoirs are reviewed briefly, and a short discussion of their geology and production history is given. W. H. C.

1574. Patents. U.S.P. 2,664,764 (15.9.51; 5.1.54). L. A. Blackburn. Foam pressure balanced walking beam type oil well pumping jack.

U.S.P. 2,664,827 (29.12.49; 5.1.54). J. R. Hatfield, assr to Cities Service Oil Co. Oil well pump assembly operative to pump selectively from 2 producing zones.

U.S.P. 2,664,828 (3.6.50; 5.1.54). G. F. Le Bus. Sand trap for oil wells.

U.S.P. 2,664,952 (15.3.48; 5.1.54). T. B. Losey, assr to Guiberson Corpn. Casing packer cup.

U.S.P. 2,664,953 (19.5.48; 5.1.54). D. D. McCormick, assr to Diamond Alkali Co. Plug setter.

U.S.P. 2,664,954 (31.12.49; 5.1.54). E. A. Johnson, assr to Standard Oil Co, Chicago. Increasing well productivity by forming a channel *A* from the bore *D* into the formation *B* by hydraulic pressure on a gelled low visc hydrocarbon *C* in *D*, injecting at a level spaced from *A* a liq solvent for *C* which filters rapidly into *B* and flowing the soln of *C* through *A* into and out of *D*.

U.S.P. 2,665,643 (24.1.51; 12.1.54). H. M. Greene. Well pump filter device.

U.S.P. 2,665,644–5 (25.1.52; 12.1.54). N. C. Wells, assr to Agate Corpn. (*a*) Well pump filter. (*b*) Well pump gas and sand control filter.

U.S.P. 2,665,758 (11.9.51; 12.1.54). M. O. Johnston and H. C. Skipper, assrs to Johnston Testers Inc. Adjustable flow bean.

U.S.P. 2,665,759 (27.12.48; 12.1.54). R. O. Childers, assr to Baker Oil Tools Inc. Method and apparatus for completing multiple production zone well bores.

U.S.P. 2,665,760 (31.5.50; 12.1.54). J. F. Hulsey. Pressure dissipating manifold for bringing in wells.

U.S.P. 2,667,122 (21.5.49; 26.1.54). L. A. Burrows and M. A. Cook, assrs to E. I. du Pont de Nemours and Co. Oil well torpedo of reduced sensitivity comprising a container for holding a liq charge of 50–85 wt % nitroglycerin and a blend of dinitro-toluene and T.N.T. in a ratio of 1–4 : 1, to the bottom of which a second container can be attached.

U.S.P. 2,667,224 (29.6.49; 26.1.54). G. C. Howard, assr to Stanolind Oil and Gas Co. Well completion process using a hydrocarbon fracturing fluid containing ¼–½ by wt of a finely divided water soluble solid and 1–3% blown asphalt.

U.S.P. 2,667,223 (3.8.48; 26.1.54). R. F. Farris, assr to Stanolind Oil and Gas Co. Apparatus for sampling wells.

U.S.P. 2,667,626 (23.1.50; 26.1.54). D. W. Blancher, assr to Bendix Aviation Corpn. Telemetering system for wells. V. P. P.

OILFIELD DEVELOPMENT

1575. World output dips. Anon. *Oil Gas J.*, 5.4.54, **52** (48), 75.—Free world production in Jan. 1954 was 11,885,100 b.d. or 0·6% less than the previous month and 2·0% higher than in Jan. 1953. Tables show world production by countries for Jan. 1954 and Dec. and Jan. 1953. C. A. F.

1576. Ohio fishes at 16,000 ft. Anon. *Oil Gas J.*, 12.4.54, **52** (49), 100.—There has been fishing for 6 months at approx 16,000 ft in the world's deepest well bottomed at 21,482 ft below the Paloma field, 15 miles SW. of Bakersfield, California. C. A. F.

1577. Kuwait. C. A. P. Southwell. *Petroleum, Lond.*, March 1954, **17** (3), 92–5.—Oil was first encountered in Kuwait in 1938, but operations were curtailed to the minimum until 1945. Not until 1946 did these oil developments play a major part in the life of the state. By 1950 oil was being shipped at the rate of 20 million tons p.a., half the figure of the present day. G. H. G.

1578. Deeper oil drilling aided by Australian wood extract. J. W. Morris. *Petroleum, Lond.*, March 1954, **17** (3), 99–100.—A wood extract from the white gum forests of Australia possesses important chemical properties enabling petroleum fields to bore to very much greater depths. The production and use of the tannin is described. G. H. G.

TRANSPORT AND STORAGE

1579. The economics of tank failures. F. A. Gitzendanner. *Petrol. Refin.*, 1954, **33** (5), 160–2.—A discussion of the economics of brittle failure of oil storage tanks. The estimated frequency is one failure per 3400 tank-years of service. R. D. S.

1580. Oil tanker and bauxite ore carrier. Anon. *Engineer, Lond.*, 1954, **197**, 526–7.—Special 7850 dw ton vessels built to maintain shuttle service between Mackenzie, British Guiana, source of bauxite ore for Aluminium Co of Canada, and Trinidad, where ore is transferred to ocean-going ships. On return trip fuel oil is carried back to Mackenzie. Bauxite stored in single continuous longitudinal central hold, oil cargo or water ballast carried in tanks either side of ore hold, extending from deck to bottom shell. A. C.

1581. Pressure drop in straight pipes. Anon. *Bull. Ass. franç. Tech. Pétrole*, 1954, 105, 231–4.—Basis of calc is explained for series of 17 charts covering steel pipes ⅛–24-inches dia and depicting, on abscissa, flow (m^3/hr) and rate (m/sec), and on ordinate, pressure drop (kg/cm^2/km), for liq of unit density. Curves cover visc 0·6–1000 cs. Transition from laminary to turbulent flow taken to be Reynolds No. of 1000. Charts for 4- and 6-inch pipes reproduced, remainder published separately. V. B.

1582. Texas pipelines. R. G. Deering. *Oil Gas J.*, 24.5.54, **53** (3), 147.—A review is given of the history of the pipeline network in Texas. There are over 82,000 miles of lines. Products lines, new equipment, automatic gauging, and future trends are described. G. A. C.

1583. How good must pipeline coating be? L. G. Sharpe. *Oil Gas J.*, 14.6.54, **53** (6), 130.—The author concludes that it is not economical to install a pipeline with the best coating money can buy, but says that optimum costs are attained with a reasonably well coated line which can be cathodically protected with moderate current quantities. Even the best coatings are not free from imperfections and require cathodic protection. G. A. C.

1584. Remote controlled pipeline pumping stations. R. S. Cannon and T. V. Bockman. *Pipe Line News*, March 1954, **26** (3), 25–8.—A study of 2 radio-controlled and 2 telephone-operated pumping stations reveals each system is reliable, and choice rests on economic considerations. A comprehensive description of the design and operation of these 4 stations is given. B. A. F.

1585. Many big gas line projects are pending in Canada. G. S. Hume. *Pipe Line News*, March 1954, **26** (3), 20–1.—Recent developments in Canadian pipeline companies are reviewed, and the merits of 30- or 36-inch line for the proposed Trans-Canada gas line are discussed. B. A. F.

1586. Pipeline companies look for big construction year in 1954. Anon. *Pipe Line News*, Feb. 1954, **26** (2), 29–32.—Reports from 22 companies are given indicating active construction in 1954. B. A. F.

1587. Lakehead pipeline now in operation. Anon. *Pipe Line News*, Feb. 1954, **26** (2), 20–8.—The 1770-mile pipeline from the Redwater field, Alberta, has recently come into operation with the completion of 645 miles of 30-inch pipe from Superior, Wisconsin, to Sarnia, Ontario. The initial throughput is 178,000 b.d., to be increased to 300,000 b.d. A description of the line construction, pumping stations, and pumping gear is given. B. A. F.

1588. Hope to start new 2240 mile gas line in Canada soon. Anon. *Pipe Line News*, Feb. 1954, **26** (2), 18–19.—Proposals for the laying of a 30- or 36-inch gas line from Princess, Alberta, to Toronto and Montreal are discussed. B. A. F.

1589. The economics of contracted airplane patrol. G. Romans. *Pipe Line News*, March 1954, **26** (3), 22–4.—Aerial patrol of pipelines gives better and quicker coverage than "line walking." Aircraft operated under contract by many firms reduce costs due to full utilization of flying time, 2 or 3 companies' lines being covered during the same trip. Flexibility of operation and the services of experienced pilots are available. B. A. F.

1590. Patents. U.S.P. 2,664,748 (16.11.46; 5.1.54). H. A. Quist, assr to Sun Oil Co. Gauge for measuring liq contents in a sealed pressure vessel for storage of volatile liq having a vapour space above the liq.

U.S.P. 2,666,109 (25.10.50; 12.1.54). L. T. Cookson, assr to Upjohn Co. Apparatus for controlling the level of liq in a vessel in which a float responsive to the level of the liq and of restricted vertical movement, operates electric switching means which start or stop the flow of liq to the vessel.

U.S.P. 2,666,445 (28.7.50; 19.1.54). J. T. Cronkhite. Device for controlling flow in pipelines. V. P. P.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1591. What's new about Sarnia? Anon. *Petrol. Process.*, 1954, **9** (6), 873–5.—Sun Oil Co's new 15,000-b.d. refinery built at Sarnia, Ontario, incorporates a number of unusual operating practices and engineering features. The plant includes a 11,500 b.d. Houdriflow cat cracking unit, a 3000 b.d. cat reforming unit, and TEL blending equipment. J. W. H.

1592. Coryton oil refinery. Anon. *Engineer, Lond.*, 1954, **197**, 746–9.—Official opening on 27 May 1954 completes project announced in Aug. 1950. Capacity is 850,000 tons p.a., and plant is equipped to produce lub oils, motor spirit, diesel oil, fuel oils, and waxes. Main plant units are 2-stage atm and vac dist, thermal reformer, Thermofor cat cracker, propane deasphalter, furfural extraction, MEK dewaxing, Thermofor continuous lub percolation, gasoline sweetening. Electrical power generated by turbine driven alternators, using steam at 615 p.s.i.g. with double passout at 125 and 20 p.s.i.g. Refinery burns propane tar, gas, or Bunker C fuel oil. Cooling water at 45 million gal/day is taken from Thames, chlorinated before use. A. C.

1593. India's refinery project takes shape. T. V. R'chandran. *Petroleum, Lond.*, Dec. 1953, **16** (12), 351–2.—Establishment of 3 oil refineries is taking shape. The Stanvac Bombay refinery will be the first modern refinery to go into production, with a charging capacity of 25,000 brl crude/day. When in operation, 3 refineries will refine 26·6 million brl crude/year.

Most of the crude oil for Stanvac refinery will be brought from the Persian Gulf area. The unit combining crude dist and fluid cat cracking is proposed for the Stanvac refinery. Products and yields are given. G. H. G.

1594. Kwinana refinery—Fremantle pipelines. Anon. *Fluid Handl.*, 1954, **53**, 114–18; **54**, 146–50.—A brief description of a 6-inch white oil and a 12-inch black oil line built from the new Kwinana refinery to the distribution centres in Fremantle, a distance of some 17 miles. An important feature influencing the calculations arose from the desire to utilize the heat lost to the ground from the lighter black products which will be pumped hot. This heating will reduce heat loss of the heavier oils to follow and hence reduce visc and pressure drop in the pipes. The second article deals with pressures and temperatures in the 12-inch line, safety measures, and pipe laying problems. D. M.

1595. Reconstruction and expansion of German refineries. Plant of Scholven-Chemie AG. W. Urban. *Erdöl u. Kohle*, 1954, **7**, 293–6.—War destruction of coal hydrogenation, *iso*-octane, and alkylation plants followed by reconstruction, first of coke-oven gas purifiers, followed by benzene refining, NH_3 manufacture, and finally petroleum refining. Crude capacity 400,000 tons/year (40/60 Kuwait/Emsland). Orthoflow cat cracker fed with heavy vac dist, and heavy oil from hydrogenation plant, latter supplied by vac residue and cracked middle dist and residue. C_4 olefins polymerized to gasoline, C_3 gas fraction used for cumene synthesis, C_2 and lower gases cracked to acetylene, latter 2 processes in plants of neighbouring companies. H_2S from all plants processed (Klaus) to 15 tons/day S. Refinery expansion to 600,000 tons/year envisaged, maintaining complete conversion of crude to motor fuels and speciality products, without production of fuel oil, which would compete with local coal. V. B.

1596. Economics of spares in refineries. J. E. Bell. *Petrol. Engr*, Nov. 1953, **25** (12), C54.—Methods of estimating frequency of failure of equipment, etc., is discussed. Selection of number of units depends on many factors. Methods outlined serve as an aid to judgment, and it is felt that such calculations are worthwhile when major capital investments are involved. G. H. G.

1597. Most economical dilution in the filtration of mixtures. G. H. Göttner. *Erdöl u. Kohle*, 1954, **7**, 286–9.—Equation is derived and graphically depicted whereby most efficient predilution for filtration can be determined with respect to solvent properties (visc, energy required for heating and evaporating) and oil visc. V. B.

1598. Operational filtration problems. B. Waeser. *Erdöl u. Kohle*, 1954, **7**, 297–300.—Review of recent literature on filters and filtration, with special reference to petroleum industry. 48 refs. V. B.

1599. French plants make alcohols, solvents, detergents. V. S. Swaminathan. *Petrol. Engr*, Nov. 1953, **25** (12), C19.—Shell's Berre plant enables an annual saving in foreign currency of $700,000. Processes at the refinery are dealt with. G. H. G.

1600. Heat exchangers: their maintenance and reconditioning. G. E. Halter. *Petroleum, Lond.*, Jan. 1954, **17** (1), 9.—Article deals mainly with the maintenance of various types of heat exchangers and procedure when reconditioning becomes necessary. G. H. G.

1601. Eliminate air-polluting smoke. W. R. Smith. *Petrol. Process.*, 1954, **9** (6), 876–81.—A 150,000–250,000 cu. ft/hr smokeless, non-atmosphere-polluting flare, built at ground level, has been in successful low-cost operation at the Esso Standard Oil Co, Bayway, U.S.A., refinery since April 1952. Smoke is eliminated by water injection into the combustion zone. 3 concentric masonry stacks are used, surrounded by an outside stack 14 ft dia × 30 ft high. J. W. H.

1602. Uniflux tray. V. O. Bowles. *Petrol. Refin.*, 1954, **33** (5), 197–8.—A description of a fractionating tray built up from a number of S members, slotted along one edge, operating in substantially the same way as bubble caps. Initial cost is about 60% of that for conventional bubble cap trays. Fabrication is simple and maintenance requirements low. Equal slot submergence, low pressure drop, and elimination of areas of interference between vapour streams are claimed to give improved performance over bubble caps. These trays are at present in use at the refinery of Socony-Vacuum Française in southern France, and rapid expansion of their use is planned. R. D. S.

1603. Kaskade trays. G. C. Thrift. *Petrol. Refin.*, 1954, **33** (5), 199–201.—Operating results comparing these trays with conventional bubble caps are given for a number of refinery services. R. D. S.

1604. Some solutions to flow control in water treating. G. E. Shaffer. *Petrol. Process.*, 1954, **9** (6), 891–3.—With water consumption in the petroleum industry estimated at 1100 gal/brl of crude oil the need for efficient water treating processes is apparent. This article discusses some of the problems met when treating raw water for use in petroleum processing plants. J. W. H.

1605. Air cooling improves economy of new gasoline plant operation. A. L. Foster. *Petrol. Engr*, Nov. 1953, **25** (12), C5–7.—The plant handles raw field gas. Forced draught air condenser cooler equipment used largely in the design of the plant, which is situated where good process water is at a premium. Equipment and flow of the plant is given. G. H. G.

1606. Disposal of refinery waste gases. D. B. Ardern and R. C. Lassiat. *Oil Gas J.*, 7.6.54, **53** (5), 99.—New techniques being applied by Sun Oil Co are described, to recover heat by cat burning of combustible materials and cat cracking unit gases. The cat consists essentially of an alloy of platinum and alumina which is coated in a 0·003-inch layer on porcelain

rods, which latter are assembled in brick-like elements and stacked in layers.

Substantial fuel savings can be realized by the recovery of heat from the gases. G. A. C.

1607. Polytrifluorochloroethylene for corrosive service. J. A. Jupa. *Chem. Engng*, 1954, **61** (6), 272–8.—This relatively new thermoplastic has many favourable characteristics which lend themselves to diversified uses in chemical processing. It has excellent mechanical properties and can be fabricated into gaskets, seals, containers, fittings, diaphragms, liners, and coatings for corrosive and thermal service. D. M.

1608. How to size refinery fractionating equipment. G. T. Atkins and G. W. Wilson. *Oil Gas J.*, 14.6.54, **53** (6), 116; 21.6.54, **53** (7), 141.—A rapid method to determine size of fractionating equipment is described. Variables considered include feed rate per sq. ft. of tower cross-section, degree of fractionation, and vapour capacity. The net heat requirement per unit of feed is related to the degree of fractionation.

Pt 2 deals with evaluation of existing facilities. Typical refinery dist services are classified so that tower sizes, heat requirements, and the amount of heat exchange surface can be estimated with a minimum of time. Correlations used for this purpose are based on overall comparisons with the existing installations. G. A. C.

1609. Patents. U.S.P. 2,667,449 (1.10.49; 26.1.54). V. Mekler, assr to Lummus Co. Heater for hydrocarbon fluids. V. P. P.

Ger.P. 908,488, 4.3.54. — Kaufmann and — Kolbe, assrs to Farbwerke Hoechst AG, formerly Meister, Lucius & Brüning, Frankfurt (M). Arrangement for heat exchange.
BrennstChemie, 1954, **35** (7–8).

Ger.P. 911,978, 8.4.54. — Wasmuth, assr to Dortmund-Hörder Hüttenunion AG, Dortmund. High pressure container.

Ger.P. 911,499, 8.4.54. — Mütschele, Ludwigsburg (Württ.). Abstracting and filling device for consumption cyl of liq gases under pressure.

Ger.P .912,387, 15.4.54. — Vollbrecht, assr to Thiedig & Co. KG, Berlin. Multipurpose apparatus for interchangeable use, as gas compressor, liq pump, also gas or liq circulation pump.
BrennstChemie, 1954, **35** (9–10). R. T.

DISTILLATION

1610. A quick method for sizing refinery distillation equipment. G. T. Atkins and G. W. Wilson. *Petrol. Refin.*, 1954, **33** (5), 144–50.—Quick preliminary estimates on refinery dist services can be made by overall comparison with existing installations. This procedure for estimating tower sizes, heat requirements, and heat exchange surfaces uses correlations which show fractionation-equipment size and capacity for various services, plotted as a function of the operating pressure. R. D. S.

1611. Binary azeotropic mixtures of methyl acetate with 28 hydrocarbons of the C_5, C_6, and C_7-range. Testing Skolnik's method for predicting azeotropic data. H. Koch and H. G. van Raay. *BrennstChemie*, 1954, **35** (7–8), 105–12.—This investigation originates from the observation that azeotropic mixtures with methyl acetate are formed in the fine fractionation of C_5–C_6 olefin fractions separated by the mercury acetate method from Fischer–Tropsch synthesis gasoline. Dist of mixtures of 28 pure hydrocarbons in the C_5–C_7 range shows that all the investigated paraffins, *cyclo*paraffins, and olefins form const-boiling mixtures with the ester, with the sole exception of benzene. Methods suggested for systematic arrangement of the results are not promising. The Skolnik formulæ, with limitations, permit connexions between hydrocarbon structure and azeotropic data of their mixtures with methyl acetate to be detected, *e.g.* dependence of the azeotropic b.p. and concn on b.p. and structure. The Skolnik method is especially suitable for observation on larger homologous groups. Details are given of the purification of the related hydrocarbons and methyl acetate. Further, data on the production and analysis of the azeotropes by fine dist in spinning-band columns, completed by estimation of sap. val. and iodine no., are given. Examples of separation of *n*-hexane and *cyclo*hexane from benzene, which forms no azeotrope, by azeotropic dist with methyl acetate, are given. R. T.

1612. Patents. U.S.P. 2,665,315 (19.3.51; 5.1.54). W. A. Herbst, assr to Standard Oil Development Co. Separation of close boiling hydrocarbon mixtures by fractional dist process in which the hydrocarbon vapours ascend countercurrently to a slurry of solid adsorbent in liq reflux, the more volatile hydrocarbon component thereby volatilizing and being removed overhead, and slurry and less volatile hydrocarbon component being removed as bottoms, the wt ratio of solid adsorbent to feed mixture being maintained >100%.

U.S.P. 2,666,019 (28.7.50; 12.1.54). F. W. Winn and L. R. Steffens, assrs to Socony-Vacuum Oil Co. A petroleum fraction containing gasoline hydrocarbons is introduced into a high pressure fractionating zone *A* at the point of minimum temp, the high b.p. components of the overhead fraction *B* being condensed and recycled as reflux to *A* and remaining gas expanded and used to cool *B*. The liq bottoms are passed to a second fractionating zone *C* operated at a pressure which is ≤ 200 p.s.i. $<$ in *A* and is ≤ 200 p.s.i., the high boiling components of the overhead fraction being recycled as reflux to *C* and the remaining vapour compressed and passed to bottom of *A*, methane and ethane being recovered overhead from *A*.

U.S.P. 2,666,303 (8.6.50; 19.1.54). P. M. Schuftan, assr to British Oxygen Co. Apparatus for separation of a gas mixture by liquefaction and rectification into higher and lower boiling fractions, including a rectification zone, an expansion turbine, and an axial flow blower directly coupled to the turbine and rotating at the same speed for reducing the pressure at which one of the product fractions leaves the rectification to below atm.

U.S.P. 2,666,737 (10.1.49; 19.1.54). C. O. Hurd, assr to Shell Development Co. Fractionating column with removable trays. V. P. P.

Ger.P. 908,729, 4.3.54. — Imhausen and — Imhausen, assrs to Märkische Seifen-Industrie o. HG, Witten (Ruhr), u. Imhausen, Witten (Ruhr). Process for stabilizing chlorination products of higher-mol hydrocarbons.

Ger.P. 909,387, 11.3.54. L. Schmidt, Wiesbaden. Method for processing solid paraffins from hydrocarbon production by Fischer–Tropsch process from CO and H_2.

Ger.P. 909,690, 18.3.54. — Fischer, assr to Ges. für Teerverwertung m.b.H., Duisburg. Process and device for distributing liq delivered to packed columns.

Ger.P. 910,100, 18.3.54. — Aschenbrenner and — Jahrstorfer, assrs to BSAF AG, Ludwigshafen (Rhein). Process for dispersing difficulty dispersible high-mol solid hydrocarbons melting above 60°.

Ger.P. 908,802, 4.3.54. — Sigwart, assr to Farbenfabriken Bayer AG, Leverkusen-Bayerwerk. Exchange column (Addn. to Pat. 744,364).
BrennstChemie, 1954, **35** (7–8).

Ger.P. 910,890, 1.4.54. — Kröger, assrs to Kröger Essen-Steele und Harpener Bergbau-AG, Dortmund. Method for liberating S-containing org compounds from di*cyclo*pentadiene recovered from benzene first runnings.

Ger.P. 911,543, 8.4.54. — Seidler and — Wille, assrs to Ges. für Teerverwertung m.b.H., Duisburg. Method for processing residues containing high-mol phenols from dist of crude phenols.
BrennstChemie, 1954, **35** (9–10). R. T.

ABSORPTION AND ADSORPTION

1613. Chemical engineering—Pt VII. Absorption and stripping. D. C. Freshwater. *Inst. Petrol. Rev.*, 1954, **8** (86), 30–3.—Absorption is the transfer of gas or vapour from a gas or vapour phase into a liq phase in which it is soluble. Stripping is the converse. In practice the 2 processes are invariably consecutive, and are very important. The theory of absorption, which is similar to fractionation, is detailed and treated mathematically. The design of absorbers used in practice is discussed. R. H.

1614. Patents. U.S.P. 2,664,967 (13.3.50; 5.1.54). B. V. Molstedt, assr to Standard Oil Development Co. In a method for countercurrently contacting gaseous material *A* with fluidized finely divided solids *B* in beds of predetermined depth *D* maintained in superimposed communicating contact zones *C*, *B* is initially introduced concurrently with *A* as it passes upwardly through *C* until depth of beds is $>D$, the flow of *B* then being reversed and excess of *C* removed.

U.S.P. 2,664,968 (30.8.52; 5.1.54). R. S. Wood, assr to Standard Oil Development Co. A gas stream *X* containing non-condensing gas *G*, condensible vapour *V*, and finely divided solids *S* is passed in countercurrent to a pumpable slurry derived from *V* and *S* to remove *S* and a predetermined proportion of *V*, at least part of the resultant slurry being recirculated and the remainder withdrawn, while scrubbed *X* is withdrawn and *V* condensed therefrom.

U.S.P. 2,666,500 (16.10.50; 19.1.54). R. P. Cahn and L. D. Etherington, assrs to Standard Oil Development Co. Cyclic process for separation of components which are less *A* and more *B* readily adsorbed on an adsorbent *C*, in which partly desorbed *C* is recycled to the adsorption zone and completely desorbed *C* is used to scrub *B* completely from *A* in a scrubbing zone.

U.S.P. 2,667,234 (25.2.50; 26.1.54). R. L. Hasche, assr to Koppers Co. Separation of acetylene from hydrocarbon pyrolysis products *A*, including C_2H_4, CH_4, H_2, CO, CO_2, and C_4H_2, by countercurrently contacting *A* with a soln comprising 1–5% water and 99–95% of an ester of formula $(R_1OR_2)_3PO_4$ (wherein R_1 and R_2 are alkyl groups with total of $>6C$) at $<25°$ C and *ca* 300 p.s.i., evaporating C_2H_2 and steam from the soln and condensing the steam. V. P. P.

Ger.P. 909,933, 18.3.54. — Rottmayr, assr to Ges. fur Linde's Eismaschinen AG, Hollriegelskreuth bei München. Process for separating C_2H_2 from low-cooled or liq gases by absorption. (Addn. to Pat. 829,738.)
BrennstChemie, 1954, **35** (7–8).

Ger.P. 910,292, 25.3.54. — Imhausen and — Keunecke, assrs to Imhausen & Co. G.m.b.H., Witten (Ruhr) and Imhausen, Witten (Ruhr). Process for recovering volatile portion in waste gas from hydrocarbon oxidn, *e.g.* low-mol carboxylic acids.
BrennstChemie, 1954, **35** (9–10). R. T.

SOLVENT EXTRACTION AND DEWAXING

1615. Influence of temperature on the liquid–liquid equilibria of the system aniline–*n*-heptane–toluene. J. Durandet and Y. L. Gladel. *Rev. Inst. franç. Pétrole*, 1954, **9**, 296–307.—Tests at 0°, 13°, 20°, and 40° C. Solubility isotherm was determined and phases of equilibrium mixtures separated and analysed by removing solvent with HCl and determining *n* of hydrocarbon mixture. Triangular equilibrium diagrams and composition of crit mixture given for the 4 temp. Decrease of temp improves selectivity, as shown by increasing aromatic content of extract. V. B.

1616. Patents. U.S.P. 2,665,196 (20.10.52; 5.1.54). N. Poffenberger, assr to Dow Chemical Co. Multistage internal mixer–settler extraction apparatus.

U.S.P. 2,665,198 (10.8.49; 5.1.54). G. N. Harcourt, assr to Blaw-Knox Co. After solvent extraction of solid particles *A*, *A* with retained solvent is passed upwardly through a passage *B* while steam is passed through *A* from both ends of *B* to an intermediate point from which steam and solvent are withdrawn.

U.S.P. 2,665,975 (10.2.51; 12.1.54). Thomas, N. G., assr to Standard Oil Development Co. Apparatus for countercurrent contact of immiscible liq of different sp. gr.

U.S.P. 2,666,730 (24.10.51; 19.1.54). J. E. Storment, assr to Phillips Petroleum Co. In filtering a chilled waxy oil–solvent mixture, the filter rate is maintained by recycling part of the chilled filter feed to a point immediately preceding the admixture of solvent and immediately mixing the oil and filter feed mixture with solvent ahead of the chilling step.

U.S.P. 2,666,794 (8.6.51; 19.1.54). N. K. Talbert, assr to Phillips Petroleum Co. Desulphurizing hydrocarbons by extraction with phenyl acetonitrile.

U.S.P. 2,667,446 (25.9.50; 26.1.54). R. A. Findlay, assr to Phillips Petroleum Co. Manufacture of high octane gasoline from straight run or natural gasoline containing light *A* and heavy *B* naphthenes, light *C* and heavy *D* paraffins, aromatics *E* and hexanes by: (1) depentanizing; (2) solvent extracting the residue to form extract phase of *A* and *E*, which is then separated into solvent, *A* and *E*, and a raffinate of *B*, *C*, and *D*, which is extracted with the recovered solvent to form a second extract phase of *B* and *C*, and separating a concentrate of *C* + hexanes, and a concentrate of *B* and solvent.

U.S.P. 2,667,447 (3.7.50; 26.1.54). S. F. Perry, G. W. Engisch, and R. A. Marriner, assrs to Standard Oil Development Co. A petroleum dist, b.p. 850°–950° F, containing paraffin and microcryst waxes, is dewaxed by adding a C_{3-6} ketone, heating until waxes dissolve, and then cooling at a rate of 2°–5° F/minute by heat exchange, with sufficient agitation to prevent wax on the chilling surfaces. V. P. P.

CRACKING

1617. Selecting a catalytic reforming process. R. A. Steel, J. A. Bock, W. R. Hertwig, and L. W. Russum. *Petrol. Refin.*, 1954, **33** (5), 167–71.—The 3 major types of reforming process considered are: non-regenerative platinum fixed-bed reforming at high pressure, regenerative non-platinum fluid or moving bed reforming, and regenerative platinum fixed-bed reforming at lower pressure. Comparisons are made on the topics of desirable feed characteristics, yields, octane potential, processing costs, and investment. R. D. S.

1618. The Model II fluid hydroformer. C. W. Tyson, E. J. Gornowski, and E. W. Nicholson. *Petrol. Refin.*, 1954, **33** (5), 163–6.—In the model I fluid hydroformer heat is supplied to the reactor as sensible heat in the feed, recirculated cat and recycle gas, the proportions being determined by thermal cracking and economic considerations. The model II supplies much of the heat by mixing shot with the cat. This shot is an inert material, more dense than the cat and of larger particle size. It will settle rapidly through the fluid bed, causing small shot hold-up and small alteration in reactor cost. The rates of shot and cat transfer from the regenerator to the reactor can be varied independently, giving greater flexibility of operation. Savings in compression, furnaces, etc., are obtained because of the considerable reduction in heat required from the recycle gas stream. The consequent reduction of 60% in the recycle gas rate allows the reactor to be made smaller. The operating principles, pilot plant development, and economics are described here. R. D. S.

1619. Autofining: a new process for catalytic desulphurization. F. W. B. Porter. *Petroleum, Lond.*, Feb. 1954, **17** (2), 53.—Abstract of paper given before the IP. Main objective of the development work of Anglo-Iranian was to evolve a cat desulphurization process which, while retaining the advantages of the hydrofining process, would also be self-supporting with respect to hydrogen. A description of the process is given, together with the lab work carried out on 3 small-scale cat plants. G. H. G.

1620. The pebble heater for more ethylene and propylene. M. O. Kilpatrick, L. E. Dean, D. S. Hall, and K. W. Seed. *Petrol. Process.*, 1954, **9** (6), 903–6.—A new process developed by Phillips Petroleum Co, called the "pebble heater," for cracking and for high temp superheating has enabled greater quantities of ethylene and acetylene to be obtained from light hydrocarbons. Details and cracking data are given for this new high temp process. Superheating temp as high as 2500° F are practical in the equipment. J. W. H.

1621. How to reduce FCCU stack losses. C. A. Seibert and D. L. Cleveland. *Petrol. Refin.*, 1954, **33** (5), 189–92.—The loss of cat out of fluid cat cracking plant stacks is shown to be directly related to the concn of 0–20 μ fines in the system. Stack losses can be reduced by withdrawing these fines from the plant via the electric precipitator hoppers. 16 months' operation with cat fines withdrawal has revealed no adverse effect on plant operation. R. D. S.

1622. Patents. U.S.P. 2,665,288 (6.9.49; 5.1.54). W. W. Odell, assr to Standard Oil Development Co. Cat vapour phase reactions are promoted by passing the gaseous reactant stream upwardly through a reaction chamber having a bottom zone of small dia containing solids of low buoyancy *A*, a top zone of relatively large dia containing solids of relatively-high buoyancy *B*, and an intermediate tapering zone containing *A* and *B*, the solids being fluidized as deep, dense, continuous beds by the gaseous stream.

U.S.P. 2,665,976 (13.12.50; 12.1.54). C. O. Rhys, assr to Standard Oil Development Co. Distributors in fluidized solids reactor vessels.

U.S.P. 2,666,021 (14.8.51; 12.1.54). D. Milsom, assr to Cities Service Research and Development Co. Cat cracked oil in No. 2 fuel oil boiling range is stabilized by contacting with AlF_3 at a temp within 50° F of the end b.p.

U.S.P. 2,666,022 (27.12.49; 12.1.54). P. H. Johnson, assr to Phillips Petroleum Co. Pour point of topped crude oil *A* is reduced by thermal cracking at 800°–1100° F/0–100 p.s.i.g. to convert 5–15% thereof to gasoline boiling range hydrocarbons, contacting the total effluent with a SiO_2–Al_2O_3 cat at 650°–900° F at atm pressure to transfer hydrogen from the higher to the lower boiling constituents, separating a highly paraffinic gasoline boiling range fraction therefrom and dehydrogenating it, passing the resulting olefinic fraction to the hydrogen exchange step, and recovering a fuel oil of 10°–30° F lower pour point than that of *A*.

U.S.P. 2,666,692 (21.7.47; 19.1.54). E. Dolezal, H. L. Hays, G. W. McCullough, and K. H. Hachmuth, assrs to Phillips Petroleum Co. Cat reactor tube assembly.

U.S.P. 2,666,731 (12.2.49; 19.1.54). E. V. Bergstrom, assr to Socony-Vacuum Oil Co. Method and apparatus for hydrocarbon conversion with improved method of transferring contact material from conversion to regeneration zone and vice-versa.

U.S.P. 2,666,732 (12.2.49; 19.1.54). E. B. McConnell, assr to Standard Oil Co. Ohio. Lub oil is decolorized by contact in a contact zone *X* in liq phase with a first stream of powdered silica–alumina *A* with both adsorbent and cracking properties and hydrocarbons are cracked in a fluid cracking zone *Y* with a second stream of *A*, both streams of *A* being regenerated together and recycled directly to *X* and *Y*, respectively.

U.S.P. 2,666,733 (27.4.50; 19.1.54). W. E. Scovill, assr to Standard Oil Co. Ohio. Lub oil is decolorized by contacting in liq phase with silica–alumina *A* having both adsorbent and cracking properties and a particle size such that *ca* 95% pass a 200-mesh screen, separating *A* from the oil and using it to crack hydrocarbons in a fluid cracking zone, regenerating *A*, and recycling it successively to contact and cracking zones.

U.S.P. 2,666,734 (12.6.50; 19.1.54). R. A. Findlay, assr to Phillips Petroleum Co. Upright pebble heater chamber for conversion of residual oils.

U.S.P. 2,667,410 (4.1.50; 26.1.54). W. R. Pierce, assr to Phillips Petroleum Co. Apparatus for controlling operation of a system for reforming hydrocarbon gas with steam to produce $CO + H_2$.

U.S.P. 2,667,448 (30.3.50; 26.1.54). J. C. Munday, assr to Standard Oil Development Co. Method of transferring fluidized solids from one chamber to another of a closed cycle.

U.S.P. 2,666,528 (26.3.49; 19.1.54). W. N. Frandsen, assr to Universal Oil Products Co. A treating chamber *C* having a perforated deck for supporting a bed of solid extending across *C* and comprising unconnected and unhinged sections *S* having their abutting portions supported on pins attached to bearing members mounted in an access opening on the exterior wall of *C*, a chain attached to each *S* and to the wall of *C* enabling *S* to hang along the wall of *C* when the pins are released.

U.S.P. 2,667,461 (21.12.50; 26.1.54). W. R. Guyer, J. P. Thorn, and E. Arundale, assrs to Standard Oil Development Co. Manufacturing a reforming cat by reacting a paste of cryst activated Al_2O_3 and aq HF (0·25–3 wt % HF on Al_2O_3) at room temp, drying, mixing with aq soln of Pt compound (0·1–2·0 wt % Pt on Al_2O_3), pptg Pt on Al_2O_3 with H_2S, drying, calcining, and reducing Pt to metal. V. P. P.

Ger.P. 911,370, 1.4.54. — Kölbel and — Ruschenberg, assrs to Rheinpreussen AG, für Bergbau und Chemie, Homberg (Ndrh.). Method for producing Fe cat for hydrocarbon synthesis. (Addn. to Pat. 765,512.)

Ger.P. 910,896–7–9–900, 1.4.54. — Schierenbeck, assr to BASF AG, Ludwigshafen (Rhein). High pressure vessel. (Addns. to Pat. 755,738.)

Ger.P. 910,898, 1.4.54. — Schierenbeck, assr to BASF AG, Ludwigshafen (Rhein). Cover for high pressure vessel. (Addn. to Pat. 755,738.)

BrennstChemie, 1954, **35** (9–10). R. T.

HYDROGENATION

1623. Patents. Ger.P. 910,050, 18.3.54. Metallges. AG, Frankfurt (M). Method for obtaining hydrocarbons and, if necessary, org compounds containing O_2 by cat CO hydrogenation.

Ger.P. 910,051, 18.3.54. — Rottig, assr to Ruhrchemie AG, Oberhausen (Rhld.). Process for cat hydrogenation.

Ger.P. 910,053, 18.3.54. — Jamm and W. Niederheitmann, assrs to Westdeutsche Mannesmannröhren AG, Düsseldorf. Synthesis furnace for cat CO hydrogenation.

Ger.P. 909,691, 18.3.54. — Büchner and — Schwarz, assrs to Ruhrchemie AG, Oberhausen (Rhld.). Process for obtaining H_2O-insol alcohols from primary products of cat CO hydrogenation.

BrennstChemie, 1954, **35** (7–8).

Ger.P. 910,539, 25.3.54. — Büchner, assr to Ruhrchemie AG, Oberhausen (Rhld.). Method for producing acetal-free fractions from CO-hydrogenation products.

Ger.P. 911,014, 1.4.54. — Rottig, assr to Ruhrchemie AG, Oberhausen (Rhld.). Method for producing CO-hydrogenation products with high cont of O_2-containing compounds.

Ger.P. 911,609, 8.4.54. — Michael and — Plauth, assrs to BASF AG, Ludwigshafen (Rhein). Process for converting CO with H_2 to hydrocarbons.

Ger.P. 911,848, 8.4.54. — Rottig, assr to Ruhrchemie AG, Oberhausen (Rhld.). Process for cat CO hydrogenation with high yield of O_2-containing C compounds.

BrennstChemie, 1954, **35** (9–10). R. T.

POLYMERIZATION

1624. *iso*Butylene polymers and copolymers. B. Blouri. *Chim. et Industr.*, 1954, **70**, 706–12; 924–8.—Review, covering general aspects of polymerization; *iso*butylene reactions

and effect of varying conditions (cat, temp) on these; physical–chemical theory of such reactions. 62 refs.
V. B.

1625. Polymerization of ethylene to lubricating oil. I. Investigations on the composition of the low-molecular fraction of the polymerization product by means of Raman analysis. G. Geiseler, R. Kaufhold, and F. Runge. *Erdöl u. Kohle*, 1954, **7**, 281–6.—Forerunnings (27°–230° C) of oil from $AlCl_3$ polymerization of C_2H_4 were fract dist and Raman spectra investigated in detail; n_D, d, and mol. wt. also determined. 19 compounds definitely identified + 7 tentatively; predominance of 2- and 3-Me-substituted paraffins, monoalkyl-*cyclo*pentanes and 1,1 substituted dialkyl*cyclo*pentanes. *cyclo*Hexane derivatives only present in small amount. Mechanism of polymerization reaction discussed; unexpectedly small content of *cyclo*hexane derivatives is due to reaction kinetics favouring 5-membered ring formation and preventing equilibrium isomerization of C_5 ring to C_6; such isomerization can be caused, *e.g.* by treating 122° C cut with 30% $AlCl_3$ for 6 hr at 100° C. V. B.

1626. Patents. U.S.P. 2,667,521 (4.11.48; 26.1.54). E. B. Harney, assr to Phillips Petroleum Co. Polymerization of low boiling mono-olefins mixed with paraffins at 275°–550° F—120–1200 p.s.i.g. using a fluidized bed of 20 μ to 10 mesh dia SiO_2–Al_2O_3 cat. V. P. P.

Ger.P. 911,661, 8.4.54. — Otto, — Güterboch, and — Daniel, assrs to BSAF AG, Ludwigshafen (Rhein). Method for producing polymerizates from *iso*butylene. (Addn. to Pat. 704,038.)
BrennstChemie, 1954, **35** (9–10). R. T.

ALKYLATION

1627. Patents. U.S.P. 2,667,519 (28.6.50; 26.1.54). W. J. Paltz and B. R. Tegge, assrs to Standard Oil Development Co. A C_{11-22} olefin is mixed with ≤ 1 mol benzene or toluene and passed with recycled alkylate and unreacted aromatic into contact with an inorganic halide alkylation cat as a sludge in a heavy reaction mixture, and a resulting liq phase of alkylate and unreacted aromatic is stratified from which a minor proportion of alkylate is recovered, the rest being recycled.
V. P. P.

Ger.P. 911,731, 8.4.54. — Ziegler and — Nagel, assrs to Ziegler, Mulheim (Ruhr). Method for producing Al trialkyls.
BrennstChemie, 1954, **35** (9–10). R. T.

ISOMERIZATION

1628. Extract *iso*butylene with H_2SO_4. G. P. Baumann and M. R. Smith. *Petrol. Refin.*, 1954, **33** (5), 156–9.—Using 65% sulphuric acid, *iso*butylene of high purity can be extracted from a refinery C_4 cut by this combined extraction–regeneration process. Careful control of conditions ensures the regeneration of *iso*butylene and not its dimer or trimer. For a feed stock containing 14% *iso*butylene, a 2-stage extraction will recover 85% of this *iso*butylene at 96% purity. Operating characteristics, flexibility, and plant costs are discussed.
R. D. S.

CHEMICAL AND PHYSICAL REFINING

1629. Produce aromatics by SO_2 process. R. A. Ratliff and W. B. Strobel. *Petrol. Refin.*, 1954, **33** (5), 151–5.—A description of a sulphur dioxide extraction process, modified to use a hydrocarbon wash oil, for the simultaneous extraction of benzene and toluene from a cat reformate. The wash oil, a relatively heavy paraffinic hydrocarbon, is introduced into the bottom of the treating tower to displace the light paraffinic and naphthenic components of the charge naphtha from the extract soln. Simple dist separates the wash oil from the extracted aromatics. Aromatics recovery of over 98% has been obtained using a single extraction tower. Benzene of 99% purity is obtained by azeotropic dist with methanol.
R. D. S.

1630. Extraction and recovery of thiols from petroleum distillates. R. L. Hopkins and H. M. Smith. *Anal. Chem.*, 1954, **26**, 206–7.—Thiols can be removed from petroleum dist by extraction with 2N sodium aminoethoxide in anhydrous ethylenediamine soln. Aromatics, and other materials, which are somewhat soluble in the reagent, can be removed by washing the extract with *iso*pentane. The thiols are quantitatively recovered by acidifying the sodium salts and steam-dist the mixture. Ethylenediamine present in the recovered thiols can be washed out with water. "Whole" dist can be treated in this manner, but it is preferable to concentrate the thiols by adsorption on alumina before extraction. The method has been successfully used in the separation of thiols from a dist boiling between 100° and 150° C. J. S.

1631. Information on reactions and reaction velocities in regeneration of washing liquors of the metalthionate process for ammonia and hydrogen sulphide purification of coal gas. The manganese sulphate process. Pt II. E. Terres, H. Buscher, and G. Matroff. *BrennstChemie*, 1954, **35** (7–8), 113–20.—Intensive investigations show that thiosulphate formation from $(NH_4)_2SO_3$ and S proceeds smoothly and completely, the required rate being controlled by temp. The reaction occurs in presence of bisulphite or pure ammonia. Thiosulphate is converted by subsequent treatment with H_2SO_3 over polythionate into neutral $(NH_4)_2SO_4$. Numerous tabulations and charts are given. R. T.

1632. The selective removal of H_2S from hydrocarbon gases. P. W. Sherwood. *Petroleum, Lond.*, Jan. 1954, **17** (1), 21–3.—Some of the main commercial processes adapted in the U.S.A. for this purpose are discussed. No one process answers the demands of every installation. American industry favours the use of mono-, di-, and triethanol-amine. G. H. G.

1633. Patents. U.S.P. 2,665,316 (21.10.50; 5.1.54). R. B. Bennett, assr to Standard Oil Development Co. Durene present in minor amounts in an aromatic hydrocarbon feed boiling 350°–425° F is recovered by chilling the feed to −95° to −105° F for 4–10 hr to form a first slurry *A* in a first mother liq, maintaining *A* at said temp for 4–10 hr, warming *A* to −25° to −75° F for 15–60 minutes, filtering off a first cake containing durene, melting this cake at 110°–150° F, cooling to 80°–105° F to form a second slurry of durene cryst in a second mother liq, which is filtered off, substantially pure durene being obtained.

U.S.P. 2,666,020 (7.6.49; 12.1.54). G. B. Arnold, H. V. Hess J. K. Truitt, and J. W. Fitzwilliam, assrs to Texas Co. Separation of waxy constituents from lub oil by contacting with urea in presence of water and an added n — C_{7-14} paraffin to form a complex therewith.

U.S.P. 2,666,048 (10.8.49; 12.1.54). J. W. Fitzwilliam and G. B. Arnold, assrs to Texas Co. Separation of C_{2-7} hydrocarbons from a wax free hydrocarbon mixture containing them by complex formation with urea or thiourea at 70°–125° F in presence of a polar solvent liq. V. P. P.

Ger.P. 909,386, 11.3.54. Edeleanu Ges. m.b.H., Frankfurt (M.), and Deutsche Erdöl-AG, Hamburg. Method for recovering dry chlorinated hydrocarbon solvents.

Ger.P. 909,138, 11.3.54. — Grosskinsky and — Umbach, assrs to Bergwerksverband zur Verwertung von Schutzrechten der Kohlentech. G.m.b.H., Dortmund. Process for separating HCN, NH_3, and H_2S from coke-oven gas with recovery of $(NH_4)_2SO_4$.
BrennstChemie, 1954, **35** (7–8).

Ger.P. 910,825, 25.3.54. — Schmalenbach, assr to Koppers G.m.b.H., Essen. Method for continuous processing of enriched benzene wash oil.

Ger.P. 911,013, 1.4.54. — Dietrich, assr to Metallges. AG, Frankfurt (M.). Wet-operated multiple-centrifugal force dust separator and its operation.

Ger.P. 911,495, 8.4.54. — Seidler, assr to Ges. für Teerverwertung m.b.H., Duisburg-Meiderich. Process for recovering phenols from tar oils.

Ger.P. 912,332, 15.4.54. — Noeske, assr to Ruhrchemie AG, Oberhausen (Rhld.). Method for processing dist residues from nitro-paraffin production.
BrennstChemie, 1954, **35** (9–10). R. T.

SPECIAL PROCESSES

1634. Dow adopts petroleum techniques in Texas. F. L. Resen. *Oil Gas J.*, 24.5.54, **53** (3), 165.—The petrochemical installations of the Dow Chemical Co at Freetown utilizes L.P.G., natural gas, and benzenes as raw materials in synthesizing a wide range of products. A table depicts the petrochemical operations. G. A. C.

1635. Texas refining and petrochemicals. F. L. Resen. *Oil Gas J.*, 24.5.54, **53** (3), 159.—A review is given of the petrochemical plants in Texas, and a table shows crude oil charge in b.d., and operating company. G. A. C.

1636. Making ammonia—2. J. C. Reidel. *Oil Gas J.*, 7.6.54, **53** (5), 86.—The new Vicksburg, Miss, plant of the Spencer Chemical Co is described which utilizes 12–15 million cu. ft/day of natural gas to make 220 tons of anhydrous ammonia. Process steps are: (1) synthesis gas preparation; (2) shift conversion; (3) gas purification; (4) addition of nitrogen, and (5) ammonia synthesis. Flow sheets and a partial oxidn table illustrate the article. G. A. C.

1637. Fluid coking. Anon. *Petroleum, Lond.*, Jan. 1954, **17** (1), 19–20.—The new fluid coking process is the latest adaptation of the "fluidized solids" technique. Estimates have shown that fluid coking will be economically attractive to many refiners, especially where difficulty is experienced in finding markets for fuel oil. An example of how the new fluid coking process might be adapted for a typical refinery is given. G. H. G.

1638. Patents. U.S.P. 2,665,199 (10.12.46; 5.1.54). H. Z. Martin and C. E. Hemminger, assrs to Standard Oil Development Co. Process for producing carbon monoxide and hydrogen from gaseous hydrocarbons.

U.S.P. 2,665,200 (1.7.48; 5.1.54). M. Kwauk, assr to Hydrocarbon Research Inc. Process for gasifying solid carbonaceous material.

U.S.P. 2,665,201 (G.B. 16.9.48; 5.1.54). N. H. Williams, assr to Humphreys and Glasgow Ltd. Manufacture of carburetted water gas.

U.S.P. 2,665,238 (12.7.51; 5.1.54). J. K. Truitt and G. B. Arnold, assrs to Texas Co. Oil shale containing kerogen, with approx an equal wt of water, is heated at $>500°$ F/ >1000 p.s.i. to convert kerogen to oil.

U.S.P. 2,665,246 (10.3.50; 5.1.54). J. R. Bates, assr to Sun Oil Co. Hydrocarbons containing finely divided sludge produced by treatment with BF_3 are contacted at 0°–60° C with an electrode providing a convergent electrostatic field having a potential gradient of <5000 volts/cm, the sludge depositing on the electrode.

U.S.P. 2,665,289 (25.9.48; 5.1.54). J. H. Arnold, assr to Hydrocarbon Research Inc. In the Fischer–Tropsch process improved use of a hydrogen-poor fresh feed synthesis gas ($H_2 : CO = 0{\cdot}4$–$0{\cdot}9 : 1$) is made by mixing with recycle gas and water vapour.

U.S.P. 2,665,194 (5.4.50; 5.1.54). M. E. Jordan, assr to Godfrey L. Cabot Inc. Production of channel carbon black.

U.S.P. 2,665,290 (30.11.48; 5.1.54). W. E. Hanford, assr to M. W. Kellogg Co. Alcohols are recovered from the oil condensate product of the Fischer–Tropsch process by conversion to xanthates by reaction with carbon disulphide and alkali, selective extraction of the xanthates with an alcohol, ketone, or cyclic ether, and treating the extract phase with mineral acid to convert the xanthates to the alcohols and reform carbon disulphide.

U.S.P. 2,666,689 (21.8.50; 19.1.54). R. L. Heider, assr to Monsanto Chemical Co. Production of HCN by passing a gaseous mixture of oxygen, ammonia, and hydrocarbons over a heated cat consisting of crystals of electrolytically produced rhodium free from carrier material.

U.S.P. 2,666,690 (28.12.51; 19.1.54). H. O. Folkins and H. Hennig, assrs to Food Machinery and Chemical Corpn. In production of CS_2 by reacting hydrocarbons with S, the preheated reactant vapours are contacted with an agglomerating agent *A* in the reaction zone *Z*, which will occlude tarry S-containing by-products, *Z* being maintained under conditions to promote formation of CS_2 and H_2S, and *A* being regenerated by oxidn to produce SO_2 which is reacted with the H_2S to produce free S for re-use.

U.S.P. 2,664,747 (8.8.49; 5.1.54). E. J. Ellis, assr to Davison Chemical Corpn. The level of a liq–solids interface *I* in a vessel *V* is indicated by means of a box supported above the liq, the box being divided by partitions of progressively increasing height into cells, from each of which one of a series of tubes of progressively decreasing length extends into *V*. A pilot stream is supplied to the cell with the longest tube and overflows into the next cell with the next shorter tube as *I* rises to indicate the level of *I*.

U.S.P. 2,664,963 (23.6.50; 5.1.54). I. W. Lovelady and S. P. Kroeker, assrs to Sivalls Tanks Inc. Gas and multiple liq separator.

U.S.P. 2,665,980 (5.5.50; 12.1.54). C. R. Carkeek, assr to Texas Co. Carbon entrained in the product stream of $CO + H_2$ produced by reacting a liq hydrocarbon with O_2 is removed by washing the gas in water, water then being separated from the aq–carbon dispersion to form an aq–carbon slurry, which is then intimately contacted with the hydrocarbon feed to transfer the carbon thereto.

U.S.P. 2,666,086 (14.11.49; 12.1.54). E. W. Pitzer, assr to Phillips Petroleum Co. Preparation of a dehydrogenation cat by mixing an iron compound, a compound of at least one metal from the group Cr, Mo, W, U, and V, and a potassium compound, each compound being an oxide or convertible to an oxide in the process, digesting the mixture with HNO_3 or NH_4NO_3, drying and calcining at 500°–1100° F, and finally comminuting.

U.S.P. 2,666,524 (31.1.52; 19.1.54). J. W. Payne, assr to Socony-Vacuum Oil Co. Separating a mixture of whole and broken spheroidal gel particles of similar hardness by bouncing from a hard inclined surface and separately collecting particles of lesser and greater trajectory.

U.S.P. 2,666,526 (2.2.51; 19.1.54). W. W. Odell and G. L. Matheson, assrs to Standard Oil Development Co. Apparatus and continuous process for separating particles of different sizes and densities *A* by turbulently fluidizing them in the space between 2 superimposed beds of fixed solids of substantially larger size *B* by means of a gas flowing upwards at 0·3–4 ft/sec, a dense fluidized mass of *A* filling the interstitial spaces of *B*, lighter *A* passing upwards and heavier *B* downwards.

U.S.P. 2,666,735 (13.8.49; 19.1.54). C. E. Morrell, C. S. Carlson, and C. E. Porter, assrs to Standard Oil Development Co. Purification of crude IPA produced by acid cat olefin hydration and containing acetone *A* and malodorous bodies *B* by adjusting pH to 8–10, preheating in liq phase at 65°–150° C—15–300 p.s.i.g. for 1–3 hr, and then extractively dist it in countercurrent to an internal reflux containing 70–99 mol % water to remove low b.p. materials, including some *A*, and obtain as bottoms aq IPA + some *A* from which *A* is dist and stripping IPA-azeotrope free from *B* from the residue.

U.S.P. 2,666,749 (21.11.51; 19.1.54). J. Hoekstra, assr to Universal Oil Products Co. Preparation of spheroidal alumina.

U.S.P. 2,666,771 (9.12.48; 19.1.54). A. C. Zettlemoyer and W. C. Walker, assrs to Food Machinery and Chemical Corpn. Isomerizing a compound containing <1 C=C bond with shift of this bond by heating in presence of active magnesia having an iodine val of <30.

U.S.P. 2,666,798 (5.5.50; 19.1.54). F. E. Condon, assr to Phillips Petroleum Co. The double bond of an olefin is shifted by contacting the olefin with 1–15 wt % of iodine at 125°–250° F in liq phase for 1–24 hr.

U.S.P. 2,667,340 (G.B. 30.11.50; 26.1.54). B. S. Robson, assr to British Insulated Callender's Cables Ltd. Gas–liq contact apparatus.

U.S.P. 2,667,407 (11.2.49; 26.1.54). M. R. Fenske and R. B. Long, assrs to Standard Oil Development Co. Apparatus for contacting a heavy with a light fluid.

U.S.P. 2,666,739 (28.4.49; 19.1.54). J. W. Packie, assr to Standard Oil Development Co. Process for removing salt from a hydrocarbon *H* in which *H* is emulsified with water by heating under pressure and then passed through a high voltage electrical coalescent section and an immediately adjoining settling section.

U.S.P. 2,666,780 (7.1.50; 19.1.54). P. Arthur and B. C. Pratt, assrs to E. I. du Pont de Nemours and Co. Preparation of a pentene nitrile by reacting HCN and butadiene at 50° C in presence of $CO_2(CO)_8$.

U.S.P. 2,667,450 (14.8.51; 26.1.54). M. C. Cines, assr to Phillips Petroleum Co. Separation of aliphatic aldehydes and hydrocarbons by azeotropic dist with perfluoro-*n*-heptane, -methyl*cyclo*hexane, -di-*n*-butylether, -tri-*n*-propylamine, or -tri-*n*-butylamine. V. P. P.

Ger.P. 908,491, 4.3.54. — Johswich, assr to Demag AG, Duisburg. Process and plant for producing CO-rich gas from natural gas and other H_2-rich, preferably gaseous fuels, *e.g.* for use as reducing agents for ores.

Ger.P. 908,614, 4.3.54. — Dorrer and — Ostermayer, assrs to BASF AG, Ludwigshafen (Rhein). Method for producing chloro-substitution products of ethylene.

Ger.P. 908,856, 4.3.54. — Eder and — Keller, assrs to BASF AG, Ludwigshafen (Rhein). Method for producing acrylic acid nitrile from HCN and gas mixtures containing C_2H_2.

Ger.P. 908,616, 4.3.54. — Schlenk, assr to BASF AG, Ludwigshafen (Rhein). Method for decomposing org compound mixtures by producing addn compounds with urea.

Ger.P. 909,130, 11.3.54. — Kloepfer, assr to Deutsche Gold- und Silberscheideanstalt formerly Roessler, Frankfurt (M.). Method for producing soot derivatives containing S.

Ger.P. 909,131, 11.3.54. — Lix and — Sonneborn, assrs to M. Huber KG, München. Process for improving soot.

Ger.P. 910,164, 18.3.54. — Fruhwirth, assr to Donau Chemie AG, Wien. Process for adding HC to unsaturated compounds.

Ger.P. 909,810, 18.3.54. — Baltes, assr to Farbenfabriken Bayer AG, Leverkusen-Bayerwerk. Method for producing chlorophenols.
BrennstChemie, 1954, **35** (7–8).

Ger.P. 911,973, 8.4.54. — Kneip, assr to Pintsch Bamag AG, Berlin. Process for converting CO with steam to CO_2 and H_2.

Ger.P. 911,491, 8.4.54. — Lüben and — Roelen, assrs to Ruhrchemie AG, Oberhausen (Rhld.). Method for producing synthetically high-boiling viscous hydrocarbon mixtures.
BrennstChemie, 1954, **35** (9–10). R. T.

METERING AND CONTROL

1639. Fuel oil measurement by means of differential pressure converter. F. Strähuber and A. Richter. *Erdöl u. Kohle*, 1954, **7**, 164–5.—Force acting on measuring unit (membrane, float, etc.) is converted to a proportional air pressure which is measured. Apparatus requires 1 m³/hr air at 1–1·2 atm. Effective for pressures of 0–20,000 mm water. Description given, with calibration details, of unit suitable for measuring oil consumption of industrial furnace (0–550 kg/hr), line 1½ inches, oil visc 6–8° E/80° C. Oil temp through meter should be within ±5° C, although variation by 30° C only causes meter error of 5%. V. B.

1640. Radioactive level control in catalyst separator surge tanks. A. Trost. *Erdöl u. Kohle*, 1954, **7**, 302–3.—Vertically situated radioactive probe of uniform intensity actuates counter outside cat container, signal intensity varied linearly by cat level and transmitted to control room. Additional radioactive indicators warn, by alarm signal, if cat level is outside min–max range. Instrument is of German design and claimed to be superior to U.S. horizontal multi-probe type; counter tube has 2-year life. V. B.

1641. Patents. Ger.P. 909,786, 18.3.54. Drägerwerk, H & B Dräger, Lubeck. Cut-off device for pipes carrying gas or liq. (Addn. to Pat. 759,156.)

Ger.P. 910,010, 18.3.54. — Hiesinger, assr to Physikalisches Untersuchungslaboratorium G.m.b.H., Onstmettingen (Württ.). Vac valve. (Addn. to Pat. 860,442.)

Ger.P. 910,011, 18.3.54. — Lohfelden, assr to Allgemeine Elektricitäts-Ges., Berlin-Grunewald. Pressure regulator.
BrennstChemie, 1954, **35** (7–8).

Ger.P. 911,137. 1.4.54. — Fernholz, Berlin-Tempelhof. Closing, filling, and extracting valve for liq gas cyl.
BrennstChemie, 1954, **35** (9–10). R. T.

PRODUCTS

CHEMISTRY AND PHYSICS

1642. Progress in colloid chemistry. J. A. Kitchener. *J. Oil Col. Chem. Ass.*, July 1954, **37** (409), 355.—The progress of some of the principal advancing fronts of colloid science is briefly indicated in non-mathematical terms. Current interest is in theoretical attempts to represent such phenomena as light scattering, abnormal visc, stabilization, coagulation, etc., by quantitative theories. Aspects discussed include classification of colloids, soln of macromolecules, and lyophobic colloids. 31 literature refs. D. K.

1643. Linear structural formulæ. G. Claxton and P. Kerr. *J. Inst. Petrol.*, 1954, **40**, 133–7.—A brief orthography for organic compounds is outlined, based on accepted symbols and conventions, which combines visual clarity with a linear form possessing advantages in typing and printing. A. R. W. B.

1644. Physical constants of a series of alkylnaphthalenes and related naphthenes. Attempts to correlate their structure with physical properties. B. B. Elsner. *J. Inst. Petrol.*, 1954, **40**, 161–9.—Physical constants of 23 hydrocarbons of mol. wt. ranging from 240 to 380 are listed. The influence of structure on V.I., refractive index, mol vol, mol refraction, density, and m.p. is discussed. A. R. W. B.

1645. Applied chemical kinetics. J. C. Jungers and A. Giraud. *Rev. Inst. franç. Pétrole*, 1954, **9**, 179–201.—Continuation of previous series (*cf.* Abs. **771**, 1954), dealing with complex reactions. V. B.

1646. Influence of tube diameter on velocity of explosive waves. H. Guénoche and N. Manson. *Rev. Inst. franç. Pétrole*, 1954, **9**, 214–20.—Mixtures of C_2H_2 and of C_2H_4 with O_2 in tubes of dia 0·9–23·6 mm. Explosion wave velocity varies with tube dia, such variation is small at mixture ratios near stoichiometrical and increases as ratio diverges therefrom. No influence on velocity detectable by variation of tube material (brass, steel, glass). V. B.

1647. Determination of liquid–liquid equilibrium. Y. L. Gladel and J. Durandet. *Rev. Inst. franç. Pétrole*, 1954, **9**, 221–35.—Bibliographical review of methods for determining,

expressing (triangular diagrams, rectangular co-ordinates, distribution curves), and predicting liq–liq equilibrium of ternary systems, (2 hydrocarbons and one solvent). Lists of such systems is given. 49 refs. V. B.

1648. Patent. Ger.P. 911,252, 1.4.54. — Reitstötter and — Wachs, Berlin-Zehlendorf. Process for improving wettability of hydrophilic surfaces of evaporators and their fillers.

BrennstChemie, 1954, **35** (9–10). R. T.

ANALYSIS AND TESTING

1649. Rapid method for the determination of sulphur in gasoline. W. R. Battles. *Petrol. Engr*, Nov. 1953, **25** (12), C47.—Only special apparatus required is the macro-sulphur lamp and a special chimney, easily constructable from standard glassware. One man with 2 lamps and 3 absorbers can run 6–8 sulphur determinations/hr. Apparatus and procedure are described. The sulphur content of gasoline determined in average time of 10 minutes with an average error less than 3% of the amount of sulphur present. Method is invaluable where less than 2 ml of sample is available, as only 0·2 ml of gasoline is burnt per determination. G. H. G.

1650. Determination of elementary sulphur in gasoline by the Sommer test. A. Albert. *Erdöl u. Kohle*, 1954, **7**, 289–91.—Mapstone's (*cf.* Abs. **643**, 1947) version of the Sommer test is negative in gasolines (containing elementary S) that have been treated with reducing agents or by doctor or hypochlorite refining; acid-treated gasolines respond to the test. Factors affecting test are examined; sensitivity can, under suitable conditions, be made as high as 1 in 10^6. V. B.

1651. The acid dew-point. J. R. Rylands and J. R. Jenkinson. *J. Inst. Fuel*, June 1954, **27** (161), 299.—Attention is drawn to the unreliability of results obtained by the conventional dew-point meter working on the electrical-conductivity principle. The investigations described utilized analytical methods of dew-point determination. It was found that the acid dew-point temp varied only slightly with wide variations of SO_3 content in combustion gases. Mechanism of sulphuric acid deposition on surfaces at temp below that of the acid dew-point and of mist-formation was investigated. The effects of HCl in combustion gases are discussed, together with the possibility of serious corrosion, due to this HCl, of metallic surfaces at temp below the dew-point. 15 literature refs and 9-page discussion. D. K.

1652. Correlation of bench tests with service. S.N.C.F. test for pure mineral oils. R. B. Brun *et al.* *Rev. Inst. franç. Pétrole*, 1954, **9**, 144–8.—SNCF (French railways) test uses Petter AV1 diesel engine. 100 hr, 1500 r.p.m., coolant (water) temp 58°–65° C, oil temp 70° C, gas oil fuel with 1% S and cetane No. 50 min. Merit ratings obtained with SAE 30–50 oils agree well with ratings found in 12-cyl 300-h.p. engines after 100,000 km. V. B.

1653. A simple electromagnetic microviscometer for semi-transparent liquids. J. Hart. *J. Sci. Instrum.*, 1954, **31** (5), 182–4.—Measurements are possible on as little as 0·04 ml liq, the method involving the observation of the motion of a small sphere propelled by non-uniform magnetic field of a solenoid energized by a known variable direct current. C. N. T.

1654. Generating low temperatures for the determination of cloud and pour points with butane. J. Taijan. *Nafta* (*Yugoslavia*), 1954, **5** (3), 76–8.—A low-temp bath for laboratory purposes is described, based on the evaporation of liq butane and light gasoline *in vacuo* from an insulated container. (Author's abstract.)

1655. Use of molybdates for estimating amount of olefinic-type hydrocarbons in air. R. D. MacPhee. *Analyt. Chem.*, 1954, **26**, 221–5.—The estimation of micro quantities of olefinic hydrocarbons is important in studies of atmospheric pollution, as these hydrocarbons oxidize under proper conditions in the air, giving compounds which can cause crop damage, eye irritation, and reduce visibility. Air samples are drawn through 20–30-mesh ascarite to remove acidic compounds and collected in a freeze-out trap using liq air as refrigerant which collects all olefins from C_2 and upwards. A molybdate reagent consisting of sodium molybdate, palladous sulphate, acetic acid, and sulphuric acid has been developed to estimate the olefins collected. The reagent changes in colour from yellow to green, depending on the concn of the olefins present. Carbon monoxide and hydrogen interfere with the test, but these are gaseous at the temp of liq oxygen, and so pass through the freeze-out trap. No expensive apparatus is required for the test. J. S.

1656. Chromatographic fractionation of crude petroleum oils. C. Karr, Jr, W. D. Weatherford, Jr, and R. G. Capell. *Analyt. Chem.*, 1954, **26**, 252–6.—It has been shown that virgin crude oils may be fractionated efficiently on activated alumina or bauxite absorbents by elution chromatography. With this procedure all the crude oil may be recovered from the absorbent as a series of fractions of differing molecular type. Typical fractions which may be produced as asphaltic semi-solids of low hydrocarbon content, asphalt-free sulphur compound concentrates, and colourless, sulphur free, metal free hydrocarbon products, such as mixtures of pure paraffins, pure paraffin–naphthene mixtures, and mixtures of pure mononuclear aromatics. The chromatographic method is simple and rapid, and readily reproducible results may be obtained.

It seems that this method may ultimately replace many of the more empirical methods of assay now being used for crude oils. J. S.

1657. Rapid determination of aromatics in petroleum fractions. Absorption with picric acid–nitrobenzene. E. A. Pasquinelli. *Analyt. Chem.*, 1954, **26**, 329–42.—A rapid and simple method has been developed for determining the aromatics in a wide variety of petroleum fractions boiling below 600° F. The method depends on the colour developed with picric acid–nitrobenzene reagent, the colour being measured with a Fisher electrophotometer. With the method, a pair of determinations can be performed in only 20 minutes, using not more than 10 ml of sample and a minimum of equipment. The method is specific for aromatics, olefins do not interfere, and thus it can be applied directly to cracking products without an additional determination as bromine no., which is often necessary in many of the existing methods. Its precision is $\pm 0{\cdot}5\%$, and its accuracy is of the order of $\pm 1\%$. J. S.

1658. Application of optical methods to the examination of lubricating greases. R. Courtel and B. Bernelin. *Rev. Inst. franç. Pétrole*, 1954, **9**, 202–13.—Examination by interference contrast, phase contrast, and polarization methods, with some comparative tests with electron microscope. Results (37 photos) given on production batches of Ca and Na greases and lab prepared Li–Ca grease; use of hot plate permits examination up to 300° C. Inspection of greases after rolling test and after service trial in vehicle bearings; on basis of 20 service trials successful prediction from microscopic study was made of behaviour, in similar trials, of 28 out of 30 additional samples. Concluded that optical methods are of value for production control, lab research, and (with some limitations) forecasting service performance (*cf.* Abs. **394**, 1953). V. B.

1659. A semi-micro molecular still for quantitative use. D. F. Rushman and E. M. G. Simpson. *J. Oil Col. Chem. Ass.*, June 1954, **37** (408), 319.—The apparatus is described, and a diagram shows the layout. The apparatus is essentially a micro-hotplate running in a high vacuum. A small dish containing the sample is placed on the hotplate, and this dish is weighed before and after heating at a suitable temp for a given time and the amount of dist found. The dist is not collected and weighed directly. Typical results of a micro separation of monomer–dimer mixtures are presented. D. K.

1660. A rapid method for determining the char value of kerosine. A. R. Javes and C. Liddell. *J. Inst. Petrol.*, 1954, **40**, 170–4.—This method involves dist the sample to a 7% residue under a nitrogen blanket and burning this residue in a modified form of the IP lamp. A. R. W. B.

GAS

1661. Influence of natural gas on operation of the well bottom pumps. C. Sierek. *Nafta (Krakow)*, 1953, **9**, 244–7.—Gas escaping from wells does not only lift liq but also carries particles of sand and increases the wear of pump valves. This depends on $\frac{3}{2}$ (or 1·5) power of the depth at which the pump is suspended. Excess of gas may interfere with the working of the valves by rapid wear on their seats. The working of a well bottom pump is described in the terms of: $R = \frac{V_{\text{gas in pump}}}{V_{\text{crude in pump}}}$ and P_s (pressure at the pump's suction valve) $= h\gamma + P_0$, where h = ht of liq above pump's suction valve, γ = sp. gr. of liquid, and P_0 = atm pressure, giving P (pressure at which all gas re-dissolves in crude) $= \frac{P_s(R+k)}{k}$ (k = solubility of gas in crude). Not before P is exceeded does crude begin to be compressed. At $P_1 > P$ the exit valve opens. A certain part of the pump volume is virtually wasted. This is given by β, the coeff of utilization of the pump. To keep this near 1 the " dead space " in the pump must be reduced to minimum. Gas should be separated from crude before entering the pump. These and other points of construction are considered. In some extraordinary circumstances $\beta > 1$, but for a pump well constructed and situated β is high. It depends on temp, and in one case it reached 99% at 11° C, falling to 92% at 63° C. Reference is made to works of Muravev and Zhukov.

M. S.

1662. Modern practice in natural gas dehydration. P. W. Sherwood. *Petroleum, Lond.*, March 1954, **17** (3), 96.—The recent rapid expansion of the natural gas industry has necessitated the development of improved methods for the prevention of hydrate formation. The 4 fundamentally different methods for the removal of water vapour from gas are dealt with: (1) compression followed by cooling; (2) refrigeration; (3) adsorption by solid desiccants; (4) absorption in hydroscopic liq media. G. H. G.

1663. Patents. U.S.P. 2,665,971–2 ((*a*) 12.5.49; (*b*) 13.11.50; 12.1.54). W. K. Lewis and E. R. Gilliland, assrs to Standard Oil Development Co. Production of pure CO_2 free of non-condensible gases by heating carbonaceous material (*a*) with particulate Fe_2O_3, V_2O_5, or SnO_2 at 500°–1200° C or (*b*) with particulate CuO at 400°–1200° C, maintained in fluidized state by CO_2 separately injected into the reaction zone.

U.S.P. 2,665,979 (31.10.49; 12.1.54). J. H. Taussig, assr to United States Gas Improvement Co. Cyclic process for reforming gaseous hydrocarbons to produce a combustible gas suitable for use in city gas systems.

U.S.P. 2,666,742 (5.11.52; 19.1.54). H. M. Walker, assr to Monsanto Chemical Co. Gas mixtures are extracted with a trimethyl ester of a C_{1-4} orthoaliphatic acid. V. P. P.

Ger.P. 910,417, 25.3.54. — Grassmann and — Grotewold, assrs to Messer G.m.b.H., Frankfurt (M.). Method for simultaneous production of pure O_2 and N_2.

Ger.P. 910,576, 25.3.54. — Lerch, assr to G. Bischoff G.m.b.H., Essen. Gas purifier.

Ger.P. 911,312, 1.4.54. — Rummel, assr to Dr C. Otto & Comp. G.m.b.H., Bochum. Process for obtaining flue gas in regenerative firing for addn. to fuel gas, contingently also serving as purging gas.

Ger.P. 911,734, 8.4.54. — Wolf and — Baumgärtner, assrs to Knapsack-Griesheim AG, Knapsack (Bez. Köln). Process for undercooling low-boiling liquefied gases.

BrennstChemie, 1954, **35** (9–10). R. T.

ENGINE FUELS

1664. New data on fuel combustion. Anon. *Petroleum, Lond.*, March 1954, **17** (3), 83.—A very fast-acting valve has been developed to obtain information on the chemical processes occurring in the cyl of an automotive engine during the combustion cycle. The results indicate that acetylene is an important intermediate in the hot flame combustion of hydrocarbons, and work is being carried out to determine the part played by acetylene in the earlier stages of combustion. There is also evidence that acetylene may be the essential intermediate in carbon formation in burning mixtures.

G. H. G.

1665. Symposium on heavy oil utilization. H. Ertl. *Erdöl u. Kohle*, 1954, **7**, 166–9.—Report on international combustion conference, Milan, 1953, to discuss heavy (residual) oil utilization in C.I. engines. Oils may have visc up to 100° E–38° C; increasing demand for light products will cause deterioration of residual quality, with consequent increase in difficulty of centrifugal purification due to rise in *d* and visc. If coolant temp is 80° C 2% S can be tolerated. For slow (150-r.p.m.) engines impurity particle size can be up to 6 μ; filtration or centrifuging of the lub oil is important. On heavy oil cyl wear rates can be 0·2–0·3 mm/1000 hr.

V. B.

1666. Aircraft turbine fuels. E. G. Davidson. *Schweiz. Arch. angew. Wiss.*, 1954, **20**, 123–9.—U.K. and U.S.A. turbine fuel specs for gasoline (wide cut) and kerosine types given and the various spec requirements discussed. Permittivity of fuel is of importance, as this const is basis of certain fuel gauges; curve given relating ε with sp. gr. Nomographs reproduced enabling dissolved air in both types of fuel to be determined for various heights and temp. Fuel filters should be effective to 10 μ, and filter test rig is illustrated and described. V. B.

1667. Foaming and aeration of oils in aviation power plant. R. Tourret. *J. R. aero. Soc.*, 1954, **58**, 53–60.—A description is given of aircraft-engine oil systems and the ways in which gas may be dispersed in oil, together with an outline of the influence of such factors as altitude and agitation rate on foaming. Foam decay is dealt with in some detail, important variables mentioned including bubble-film thickness, oil visc, and temp. Other aspects considered are oil-system performance, the prevention of foam in service, and the use of anti-foaming agents. C. N. T.

1668. Alcohol in diesel engines. H. A. Havemann, M. R. K. Rao, A. Natarajan, and T. L. Narasimhan. *Auto. Engr.*, June 1954, **44** (6), 256.—An investigation was carried out to determine the advantages and disadvantages of using alcohol in C.I. engines with a high C.R. An attempt was made to discover a method of using heavy fuels in high speed C.I. engines. A review of previous work carried out to improve the ignition quality of fuels and to minimize the deleterious effects of high sulphur and carbon residues is given. Tests with alcohol–diesel fuel blends proved unsatisfactory, and further tests with carburation of alcohol and injection of different diesel fuels were undertaken. The results of these tests are discussed comprehensively, and numerous graphs are included. It is claimed that alcohol can be used as a power booster fuel in high C.R. C.I. engines; better air utilization is obtained under overload conditions; alcohol carburation promises to be a cheaper and simpler alternative to supercharging for periodic boosting; this system results in a cleaner exhaust, especially at high power outputs. 10 refs.

T. T.

1669. Patents. Ger.P. 909,568, 11.3.54. — Becker, assr to Ges. für Linde's Eismaschinen AG, Hollriegelskreuth bei München. Process for obtaining fuel gases.

BrennstChemie, 1954, **35** (7–8).

Ger.P. 911,443, 1.4.54. — Glinka, Krefeld-Uerdingen. Process for power production from high-H_2O-cont fuels.

Ger.P. 912,159, 15.4.54. — Freitag, Freudenthal (kr. Konstanz). Process for obtaining readily-combustible diesel fuel from coal tar oils.

BrennstChemie, 1954, **35** (9–10). R. T.

GAS OIL AND FUEL OIL

1670. Fuel oils: their efficient and smokeless combustion. K. H. Sambrook. *Petroleum, Lond.*, Feb. 1954, **17** (2), 56.—The 2 major problems in fuel utilization are conservation of fuel resources and reduction of atmospheric pollution. In this article it is shown to what extent these objects are achieved, and how smoke detection and measurement is made. Possible causes of smoke emission are given. G. H. G.

1671. The stability and compatibility of fuel oil and diesel fuel. C. W. G. Martin and D. R. Bailey. *J. Inst. Petrol.*, 1954, **40**, 138–50.—The physical stability of asphaltene systems as related to blended fuel oils is discussed. Evidence shows that it is important to have some means of assessing the state of peptization of the asphaltenes and the use of data from xylene equivalent–flocculation ratio tests to obtain this information is discussed. Experimental work has shown that the part played by additives in promoting stability is small, and that care in blending is normally sufficient. A. R. W. B.

1672. Patent. U.S.P. 2,665,978 (25.9.51; 12.1.54). R. D. Stayner and R. A. Stayner, assrs to California Research Corpn. Hydrocarbon fuel oil composition containing a small amount, sufficient to inhibit line and filter clogging and corrosion, of an N, N-di-(alkylaryl methylene)-N-alkyl ammonium alkane sulphonate in which the first alkyl contains 9–18 C, N-alkyl and alkane groups each contain 1–7 C. V. P. P.

LUBRICANTS

1673. Engine testing of lubricating oils. Anon. *Petroleum, Lond.*, Dec. 1953, **16** (12), 356–7.—Abstracts of papers from a symposium arranged by IP. Papers include the radio-active tracer technique to study engine wear, some aspects of statistical techniques applying to the engine testing of lub oils, oil requirements for public and haulage utilities, military requirements for lub oils for I.C. engines, notes on heavy-duty oils, and some experiences of a diesel engine manufacturer. G. H. G.

1674. Some aspects of extreme pressure lubrication. F. F. Musgrave. *Erdöl u. Kohle*, 1954, **7**, 291–2.—Hypoid gear lubrication discussed, views previously expressed (*cf.* Abs. **514**, 1946) as to suitability of SAE extreme-pressure tester are now modified, and necessity for full scale tests for adequate lubricant evaluation are stressed (*cf.* Abs. **641**, 1953; **195**, 1954). U.S. specification MIL-L-2105 covers lubricant of wide applicability. V. B.

1675. High pressure lubricants. G. Cibula. *Erdöl u. Kohle*, 1954, **7**, 181–2.—Need for EP lubricants in metal working and gear lubrication is explained. General use of Pb naphthenate pressure greases is less common in Germany than abroad. Principles of 4-ball, Wieland and Falex testers are briefly described; oils passing 4-ball test are likely to be satisfactory in use, although oils failing this test may likewise be usable; on other hand, whilst oils passing Wieland test need not necessarily be satisfactory, oils those failing this test will not stand up to EP conditions. Main benefit of such tests is to assure constancy of production. V. B.

1676. Standardization of viscosity grades. E. Borchert. *Erdöl u. Kohle*, 1954, **7**, 306–8.—Draft standards DIN 51511 and 51512 are reproduced, giving the cs and °E equivalents for SAE crankcase oils (5W–50) and transmission and axle lubricants (75–250), respectively. V. B.

1677. Molybdenum disulphide as lubricant. G. Spengler. *Erdöl u. Kohle*, 1954, **7**, 156–60.—Natural MoS_2 requires high purification to be suitable as lubricant, synthetic MoS_2 is not suitable, owing to different structure. Crystal structure of MoS_2 is described and compared with graphite, comparative table of lub properties of the 2 materials given. Unlike graphite, lub properties of MoS_2 do not depend on film of moisture, and material is effective in high vac and at low temp. MoS_2 can be employed in range −40°–400° C, and is not affected by atm O_2 up to the higher temp. MoS_2 is non-corrosive, although anti-corrosion action is not proven; it is non-conducting, and hence can be utilized where graphite would be unsuitable. Surface film of MoS_2 shows decrease of coeff friction with increasing load. V. B.

1678. Regeneration of the highly aged lubricating oils. G. Woyslaw. *Nafta (Krakow)*, 1953, **9**, 247–9.—Turbine and insulating oils which come up for regeneration can be adequately regenerated if their acid value is around 0·25 mg KOH/g. When this value has been exceeded their oxidn stability is found to have been destroyed by the loss of asphaltenes and resins. Although the acid value and saponification value of such oils can be lowered by acid–clay or acid–alkali–clay treatment, their stability is restored by admixture of 25–40% of unused oil. 4 tables illustrate points made. M. S.

1679. Engine oils. S.A.E. numbers and their significance. R. H. Warring. *Auto Engr*, June 1954, **44** (6), 235.—The system of SAE classification of motor oils is described, and the SAE specifications are given. The significance of visc and V.I. is discussed, and a list of representative commercial oils is included. T. T.

1680. Patents. U.S.P. 2,665,252 (25.9.48; 5.1.54). C. F. Prutton, assr to Lubrizol Corpn. Lub oil containing 0·5–10% of a metal salt of paraffin wax substituted diphenyl oxide sulphonic acid sulphide.

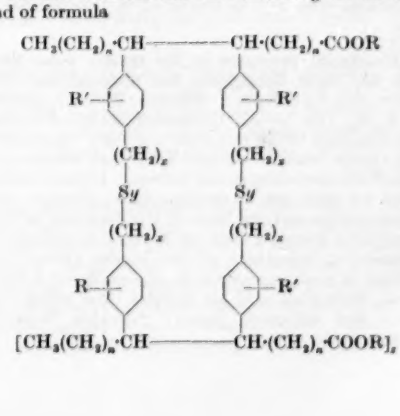
U.S.P. 2,665,253 (23.6.50; 5.1.54). W. C. Hollibaugh, assr to Sun Oil Co. Mineral lub oil containing an oxidn-inhibiting amount of a 1, 2-di-C_{1-9} alkoxy benzene, for use at high temp.

U.S.P. 2,665,254 (23.6.50; 5.1.54). W. J. Coppock, assr to Sun Oil Co. Mineral lub oil containing an oxidn-inhibiting amount of a compound of formula $ROCH_2{-}CH{-}CHR'$ (with O), wherein R = aryl, R′ = H, Me, or Et, for use at high temp.

U.S.P. 2,666,033 (11.4.51; 12.1.54). J. P. Dilworth, W. J. Finn, and O. P. Puryear, assrs to Texas Co. Lithium soap grease containing methacrylate ester polymer for bearing noise suppression.

U.S.P. 2,666,044 (9.3.51; 12.1.54). W. E. Catlin, assrs to E. I. du Pont de Nemours and Co. A lub oil soluble copolymer of 55–97·5% polymerized acrylic or α-alkyl acrylic ester of C_{12-18} saturated aliphatic alcohols, 2–15% of N-aryl-substituted amide of acrylic or α-alkyl acrylic acid, and 0·5–20% of a polymerized ethylenically unsaturated basic tertiary amino compound.

U.S.P. 2,666,743 (27.10.50; 19.1.54). E. W. Brennan, assr to Pure Oil Co. Mineral lub oil containing an oil soluble compound of formula



wherein R = H, alkyl, or an alkali or alkaline earth metal, R′ = alkyl; n = integer of 2–7; x = integer of 0–4; y = integer of $\lt 1$; $z = 0$ or 1.

U.S.P. 2,666,744 (5.3.52; 19.1.54). J. A. Dixon, assr to California Research Corpn. Grease composition of mineral lub oil thickened with 3–50% of a sulphurized metal soap obtained by reacting sulphur with a metal soap of an unsaturated fatty acid and containing 0·25–1 atom of S per double bond. The grease has E.P. and anti-wear characteristics, and additives to inhibit bleeding and corrosion are not required.

U.S.P. 2,666,745 (1.12.50; 19.1.54). L. V. Mullen and J. M. Boyle, assrs to Standard Oil Development Co. Preparation of corrosion-inhibiting additives for hydrocarbon oils by reacting equimolar amounts of: (*a*) an unsaturated dialiphatic hydrocarbon substituted cyanamide containing 1–30 C atoms in each alkyl group and $\lt 1$ unsaturated group in $\lt 1$ alkyl group, *e.g.* diallyl cyanamide, and (*b*) a primary or *sec*-aliphatic or *cyclo*aliphatic amine, and sulphurizing the reaction product until it contains 10–30% of combined S.

U.S.P. 2,666,746 (11.8.52; 19.1.54). J. C. Munday and D. T. Rogers, assrs to Standard Oil Development Co. Mineral lub oil containing an oil-sol copolymer of a vinyl ester of a C_{2-18} fatty acid and a di-C_{10-18}-alkyl fumarate as pour point depressant.

U.S.P. 2,666,747 (11.8.52; 19.1.54). J. H. Bartlett, assr to Standard Oil Development Co. Waxy mineral lub oil containing 0·01–10 wt %, based on total composition, of a copolymer (mol. wt. 2000–20,000) of 270–144 parts of an itaconic acid ester having 10–18 C per ester group and 75–30 parts of a vinyl ester of a C_{2-18} fatty acid. V. P. P.

Ger.P. 908,611, 4.3.54. — Clar and — Geiser, assrs to Ruhrchemie AG, Oberhausen (Rhld.). Method for producing ageing-resistant lub oils. (Addn. to Pat. 902,373.)

Ger.P. 909,618, 11.3.54. — Kölbel and — Ullmann, assrs to Rheinpreussen AG, für Bergbau u. Chemie, Homberg (Ndrh.). Method for producing high-pressure lub. (Addn. to Pat. 898,343.)

Ger.P. 909,388, 11.3.54. — Behringer, — Reibnitz, and — Lober, assrs to BASF AG, Ludwigshafen (Rhein.). Method for producing cutting oils and fats.
BrennstChemie, 1954, **35** (7–8).

Ger.P. 911,728, 8.4.54. — Kretz and — Hansen, assrs to Byk-Gulden Lomberg, Chem. Fabr. G.m.b.H., Konstanz, and Brennstoff Tech. G.m.b.H., Essen. Use of low-temp coal tars produced in heating-surface furnaces as raw material for motor fuel oils.
BrennstChemie, 1954, **35** (9–10). R. T.

BITUMEN, ASPHALT, AND TAR

1681. Bituminous materials, their processing and use mirrored in newer German patent literature. H. Hoffmann. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (4), 110–12.—Newer patent specifications classified as described in this journal, 1953, **4** (1), 15. R. T.

1682. Interfacial processes in the system water–bituminous binders and their importance for construction. Pt I. R. Wilhelmi and K. Schulze. *Bitumen, Terre, Asphalte, Peche*, 1954, **5** (4), 104–7.—An illustrated study of spreading of bitumen binders on liq and solid surfaces. Bitumen binders spread always when in contact with clean water–air contact surfaces if the spreading power suffices. If the 3 media, water, air, and liq drop are in mechanical equilibrium Newman's equation applies and the form of the drop can be calc. For solid surfaces Young's form of Newman's equation applies. The spreading behaviour of the binder affects the water sensitivity of surface treatments, especially with highly fluid binders. Raindrops and air bubbles then affect the binder covering and adhesive power. Adhesion improvers are discussed. R. T.

1683. Resistance of road tars to oxidation. H-G. Franck. *Bitumen, Terre, Asphalte, Peche*, 1954, **5** (5), 129–31. A method is developed for determining the resistance to oxidn of road tars. The high resistance of German—chiefly aromatic, high-temp tars—is confirmed by pressure oxidn tests at Harmondsworth, Middlesex. R. T.

1684. Tar chip investigation. H. Mallison. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (5), 132–4.—Factors influencing production of tar chips are tabulated. Temp is important, and may be gauged roughly with the hand. It is calculated accurately from the final temp obtained by mixing a known wt of chips with a given vol of H_2O at 20° C. The correct quantity of tar to give the required adhesiveness is determined by timing the total fall of a truncated cone prep as described. Methods for determining the quantity of tar present are discussed. R. T.

1685. Change of bituminous wearing layers from blast furnace slag under traffic action. F. Schulz. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (5), 139–42.—Tests on layers on experimental stretches, made to the Ilseder Schlackenverwertung receipts have proved the best, independently of the traffic burden. After 18 months, great compression and grain refinement produce a cavity-free surface sufficiently elastic to form a sound bond with the Macadam base, under traffic. This occurs both with ISV and standard cut-back bitumens. Results show superiority over all other types of binders in producing the required properties in minimum time. R. T.

1686. Last year's experiences in bituminous road construction. Report on German and foreign road campaign. — von Skopnik. *Bitumen, Terre, Asphalte, Peche*, 1954, **5** (5), 145–50.—The development of bituminous road construction reported in the previous year's tech journals is reviewed. 150 literature refs. R. T.

1687. Patents. U.S.P. 2,667,425 (2.2.50; 26.1.54). L. A. Bierly, assr to Presque Isle Laboratories and Manufacturing, Inc. Self-extinguishing composition comprising a mixture of asphalt, 5–40% chlorinated ($\lt 50\%$ Cl) paraffin *A*, and 5–40% antimony oxide *B*, *A* + *B* forming 25–100 wt % of the asphalt and rest filler. V. P. P.

Ger.P. 910,885–6–7, 1.4.54. — Bähr, assr to BASF AG, Ludwigshafen (Rhein.). Process for obtaining tar and compact low-temp coke. (Addns. to Pat. 735,726.)
BrennstChemie, 1954, **35** (9–10). R. T.

SPECIAL HYDROCARBON PRODUCTS

1688. Patents. U.S.P. 2,665,206 (15.6.48; 5.1.54). T. F. Bradley, assr to Shell Development Co. Cellulose fibres are sized with a ppt of a cyclic extract of predominantly aromatic and naphthenic nature from a mineral oil and 3–75% of naphthenate salts derived from acids of average acid no. 100–200, based on total wt of extract + salts.

U.S.P. 2,665,207 (29.6.48; 5.1.54). F. M. McMillan and R. D. Sullivan, assrs to Shell Development Co. A paper product comprising cellulose fibres sized with 0·5–5 wt % of a mixture of naphthenates derived from acids of average acid no. $\gt 200$ to $\lt 400$ and cyclic components of petroleum sol in solvents which are selective for the non-paraffinic components.

U.S.P. 2,665,983 (2.8.48; 12.1.54). A. B. Bakalar and R. D. Sullivan, assrs to Shell Development Co. Paper pulp is sized with an aq slurry of a hydrocarbon of visc 400–50,000 SUS/210° F containing 0·05–5 wt % of a polyphosphoric acid and a mutual solvent, an acidic agent being added to ppt the emulsion on the pulp.

U.S.P. 2,666,038 (8.8.50; 12.1.54). J. B. Eisen, assr to American Viscose Corpn. Textile finishing composition which is an O/W emulsion comprising, in parts by wt, 4–20 naphthenic oil, 1–20 water-dispersible polymeric colloid, 1–5 of ester of $C_{\lt 12}$ fatty acid ester of a hexahydric alcohol or anhydro derivative thereof, ratio of ester–oil being 5 : 16, 1–5 alkaline buffer, and water. V. P. P.

Ger.P. 910,052, 18.3.54. — Scheuermann and — Schmole, assrs to BASF AG, Ludwigshafen (Rhein). Method for producing solid paraffin hydrocarbons.

Ger.P. 910,166, 18.3.54. — Kuber, assr to Ges für Teerverwertung m.b.H., Duisburg. Process for obtaining pure quinoline from coal tar.

Ger.P. 909,852, 18.3.54. — Zerbe, assr to Deutsche Shell AG, Hamburg and Metallges. AG, Frankfurt (M.). Process for obtaining hydrocarbons sol in H_2SO_4.
BrennstChemie, 1954, **35** (7–8).

Ger.P. 911,132, 1.4.54. — Lotz, assr to Vereinigte Glanzstoff–Fabriken AG, Wuppertal-Elberfeld. Method for producing *p*-xylylene dichloride.

Ger.P. 911,730, 8.4.54. — Querfurth, assr to Deutsche Gold- und Silber-Scheideanstalt formerly Roessler, Frankfurt (M.). Method for, producing higher-mol alcohols.

Ger.P. 911,849, 8.4.54. — Brendlein, assr to Deutsche Gold- und Silber-Scheideanstalt formerly Roessler, Frankfurt (M.). Method for producing aliphatic or alicyclic diethers.
BrennstChemie, 1954, **35** (9–10). R. T.

DERIVED CHEMICAL PRODUCTS

1689. Synthesis of petrochemicals—4. Phenol, acetone from cumene. A. L. Foster. *Petrol. Engr*, Nov. 1953, **25** (12), C3–4.—2 organizations are carrying out research on the production of phenols via the hydroperoxides of aromatic derivatives route. Process is outlined for the production of phenol and acetone. The most important principle in the synthesis is that a large number of chemical and industrially important products can be made economically. Plant cost for the synthesis is given. G. H. G.

1690. The newer petroleum products. G. Egloff. *Petroleum, Lond.*, Dec. 1953, **16** (12), 362.—Petrochemicals form 25% of all chemical production in the U.S.A. Thousands of chemicals are being made from petroleum and natural gas. Survey of present and future uses of the main markets for petroleum hydrocarbons, *e.g.* manufacture of plastics, rubber textiles, detergents, and agricultural chemicals. G. H. G.

1691. Supplying the chemical industry with cooling water. M. Sekardi. *Nafta* (*Yugoslavia*), 1954, **5** (3), 65–9.—The author discusses the general needs of cooling water in the chemical industry, as well as its sources and treatment. Recycle cooling in spray towers is pointed out, with basic theoretical principles and methods of designing based thereon, Some practical data are given. (Author's abstract.)

1692. Patents. U.S.P. 2,665,305 (20.11.52; 5.1.54). H. E. Cier, assr to Standard Oil Development Co. Colour degradation of a hydrocarbon sulphonyl chloride product containing dissolved sulphur dioxide, chlorine, and hydrogen chloride is prevented by introducing the product into a pool of a light hydrocarbon *A* boiling 95°–210° F and vaporizing at least partially *A* with dissolved impurities. V. P. P.

Ger.P. 912,089, 15.4.54. — Rottig, assr to Ruhrchemie AG, Oberhausen (Rhld.). Method for producing nitro-hydrocarbons. (Addn. to Pat. 888,241.)

Ger.P. 912,331, 15.4.54. — Jüttner and — Lange, assrs to Jüttner, Essen. Method for producing H_2O-sol aromatic carboxylic acids.

Ger.P. 912,091, 15.4.54. — Murata, Kagoshima (Japan). Method for producing addn compounds of SO_2 to low-mol aliphatic carboxylic acids.
BrennstChemie, 1954, **35** (9–10). R. T.

COAL, SHALE, AND PEAT

1693. Correlation and practical application of results from laboratory and practice. (H) Crude benzene, from laboratory and coal by-product plant. W. Mantel and H. Hansen. *BrennstChemie*, 1954, **35** (7–8), 97–104.—A comprehensive study of the behaviour of various coals during coking. Measures for increasing crude benzene yield, and for qual influence of products, must rest on knowledge of the genetic relationship in the formation of aromatic hydrocarbons, also on the chem–physical conditions for their recovery. Other accompanying compounds are discussed. A method is given for *cyclo*pentadiene estimation. Numerous charts are presented. 13 refs. R. T.

1694. Patents. Ger.P. 910,530, 25.3.54. — Terres, Karlsruhe. Process for dehydration and enrichment of materials with colloidal properties, *e.g.* peat and brown coal. (Addn. to Pat. 903,813.)

Ger.P. 910,775, 25.3.54. — Sickel, Hamburg. Method and plant for processing raw peat to peat with low liq cont.

Ger.P. 910,713, 25.3.54. — Flesch, assr to BASF AG, Ludwigshafen (Rhein). Process for degassing and contingently gasifying fine-grained bituminous fuels.

Ger.P. 911,313, 1.4.54. — Daniels, assr to H. Koppers G.m.b.H., Essen. Plant for gasifying pulverulent or fine-grained fuels.

Ger.P. 911,314, 14.5.54. — Totzek, assr to H. Koppers G.m.b.H., Essen. Process and plant for producing high-cal. val. fuel gas from pulverulent fuels.

Ger.P. 912,208, 15.4.54. — Schmitz, Wiesbaden. Process for treating peat. (Addn. to Pat. 899,493.)

Ger.P. 911,887–8, 8.4.54. — Daniels, assr to Koppers G.m.b.H., Essen. Gas producer. (Addns. to Pat. 757,974.)

Ger.P. 912,385, 15.4.54. — Danulat, assr to Metallges. AG, Frankfurt (M.). Process and plant for pressure gasification of solid fuels.
BrennstChemie, 1954, **35** (9–10). R. T.

MISCELLANEOUS PRODUCTS

1695. Detergents effect on skin. Anon. *Soap, N.Y.*, Nov. 1953, **29** (11), 44.—Extracts are given from a University of Pennsylvania publication by Drs E. J. Van Scott and J. B. Lyon entitled "A Chemical Measure of the Effect of Soaps and Detergents on the Skin."

It was found that suspension of various types of keratin (stratum corneum, nails, and hair) in soln of soaps and detergents increased the measurable amounts of sulphydryl groups. The denaturing effect of soaps and detergents on the keratin molecule and possible influence of this effect on dermatitis were discussed. M. V. J.

1696. Detergents for radiological decontamination. F. D. Snell, G. Segura, Jr, S. Stigman, and C. T. Snell. *Soap, N.Y.*, Oct. 1953, **29** (10), 42.—Experiments were undertaken to determine the effectiveness of a number of soaps and detergents in removing radioactive soil from various surfaces. Heavy duty synthetic detergents used alone were effective. Good results were also obtained with soaps or syndet and Calgon in 1 : 2 ratio. The nature of the surface influenced the result—cement being particularly difficult to clean. 11 refs. M. V. J.

1697. Radioactive tracers in insecticide research. Pt II. P. A. Dahm. *Soap, N.Y.*, Oct. 1953, **29** (10), 148.—Radioisotope-labelled insecticides are listed. Literature refs to (*a*) method of preparation, and (*b*) applications are given. The more significant findings are discussed. 41 refs. M. V. J.

1698. Vinyl emulsion polymers and their use in coatings. C. E. Hollis and J. H. Turner. *J. Oil Col. Chem. Ass.*, June 1954, **37** (408), 283.—The mechanism of radical-initiated vinyl polymerization is outlined. Polymerization in aq emulsion is also reviewed. Formation of a film from polymer emulsion is shown to depend largely on surface tension forces, and therefore on amounts and type of plasticizer used. Properties of emulsion paints based on polystyrene or polyvinyl acetate are

surveyed, and the interrelation of sedimentation, paint consistency, and ease of application are discussed. Particle size of polymer emulsion and protective colloids present both greatly influence flow properties and stability of emulsion paints. Principles to be followed in the formulation of a satisfactory emulsion paint based on polyvinyl acetate or polystyrene are given. 12 literature refs. D. K.

1699. The prevention of defects in emulsion paints. A. C. Fletcher, S. H. A. Hirsch, and J. E. O. Mayne. *J. Amer. Oil Chem. Soc.*, June 1954, **37** (408), 300.—The most common failures of polyvinyl acetate emulsion paints and ways of preventing them are described. The following aspects are considered: variations of visc and shade on storage, stability to freezing, development of uneven finishes, pinholing and cratering, drag on recoating, loss of adhesion including blistering and flaking, discoloration, and the effects of efflorescence. D. K.

1700. Mechanical properties of polysulphide polymers. J. S. Jorczak. *Mech. Engng, N.Y.*, June 1954, **76** (6), 503.—A history of the development of polysulphide polymers is given, and the properties and applications of this material are discussed. T. T.

1701. The chemical nature and physical properties of aluminium soaps. A. E. Alexander. *J. Oil Col. Chem. Soc*, July 1954, **37** (409), 378.—The structure of aluminium compounds with fatty acids is discussed. Non-aq reactions such as those between aluminium alkoxides and fatty acids have been investigated by the author. There is no evidence for the existence of mono- and tri- soaps, but $Al(OR)L_2$ and $AL(OH)L_2$ exist (L denotes fatty acid radical and R alcohol radical). The physical properties, particularly in solution, of aluminium soaps are discussed. D. K.

1702. Influence of accumulated soil on bacterial population of milking machines. W. L. Mallmann, F. Peabody, and D. Muentener. *Soap, N.Y.*, Nov. 1953, **29** (11), 132.—After a brief review of previous work indicating that bacterial populations are influenced as much by good cleaning procedure as by the use of sanitizers, the authors report a study of the use of a quaternary ammonium compound and a hypochlorite as sanitizers for milking machines. Low milk counts were obtained when well cleaned machines were rinsed with sanitizer soln (200 p.p.m.) or water. When the detergent wash was omitted neither sanitizer prevented increased milk counts, due to accumulated soil becoming apparent after approx 4 days. 4 refs. M. V. J.

CORROSION

1703. Aspects of the fight against corrosion in the U.S.A. petroleum industry. H. Moreau, J. Barbier, and J. Tourret. *Bull. Ass. franç. Tech. Pétrole*, 1954 (104), 97–128.—Account of visit by French OEEC mission. Annual cost of corrosion in the U.S.A. is $> \$6 \times 10^9$. Brief description of activity in this field by engineering companies, universities, oil companies, anti-corrosion product manufacturers, research laboratories, and also by bodies such as NACE, ASTM, and API. Anti-corrosion measures more particularly considered are inhibitors, alloys, and non-metallic coatings. V. B.

1704. Control crude unit with new inhibitor. F. L. Resen. *Oil Gas J.*, 7.6.54, **53** (5), 111.—The method employed by Southwestern Oil and Refining Corpn to control corrosion of crude units is based on neutralization of organic acids by injection of NaOH to form a metallic soap, which later also scrubs out inorganic acids. G. A. C.

1705. Simple corrosion theory as an aid to materials selection—1. T. K. Ross. *Petroleum, Lond.*, Apr. 1954, **17** (4), 116–18.—The problem facing the designer of refinery plant or the choice of materials of constructoin in relation to corrosion is discussed, and the corrosion theory equated with the practical element of materials selection. G. H. G.

1706. Inspection of petroleum refinery equipment. E. H. Tandy. *Corrosion*, 1954, **10** (5), 160–4.—The author points out the importance of regular inspection of refinery equipment and outlines the technical qualifications required by a corrosion inspector. The paper includes a discussion of the corrosion of plant by hydrogen sulphide and naphthenic acids and the corrosion by moisture, oxygen, and other gases of gasoline storage tanks. W. G. R.

1707. Position of paint and varnish technology in the field of corrosion prevention. G. Sprock. *Erdöl u. Kohle*, 1954, **7**, 309–11.—General discussion of protective coatings for ferrous materials. Bright paints preferable to matt, as they are less liable to collect dust. 4 coats desirable, of total thickness 160–200 μ, but 2 suffice if prior hot galvanizing is carried out. Coverage is in range 4–10 m^2/kilo. Annual cost of corrosion in Germany estimated at $1–2 \times 10^9$ DM. V. B.

1708. New techniques—current problems in controlling corrosion. O. C. Mudd. *Pipe Line News*, Feb. 1954, **26** (2), 34–9.—A review of the requirements of a good pipe coating together with results of elongation and penetration tests on typical pipe enamels. Stress is laid on thorough trench bottom preparation and careful back-filling to prevent damage to coating during pipe laying. B. A. F.

1709. Shell's experience with corrosion in gas heaters. R. G. Wright. *Oil Gas J.*, 21.6.54, **53** (7), 161.—The monoethanol-amine–water soln method is used to sweeten 22,000 m.c.f/day of sour residue gas. A table shows operating temp and length of service of tube bundles in months. G. A. C.

1710. Combating heat-exchanger corrosion in glycol-amine gas treating plants. F. Paredes and J. W. Cronenberg. *Oil Gas J.*, 21.6.54, **53** (7), 159.—The experience of El Paso Natural Gas Co shows that heat exchanger corrosion can be alleviated by the use of aluminium alloys and Croloy 5. Heat exchanger life has been increased from a minimum of *ca* 4 months to an estimated life of 2 years by use of aluminium. Better methods of tube support should be found. G. A. C.

1711. Cathodic protection of the interior of cargo compartments in oil tankers. Anon. *Engineer, Lond.*, 1954, **197**, 618.—Precis of paper presented by J. Lamb, E. V. Mathias, and W. G. Waite, to Inst. of Engineers and Shipbuilders. By installation of Mg alloy anodes, and employment of suitable current densities, an alkaline calcareous film is built up on steel bulkheads while under sea water ballast. This film then protects bulkheads during subsequent carrying of "white" cargoes or when tanks empty. Tests on tanker *Auris* showed 75% reduction in corrosion over tank bottom structure by this method, the figure diminishing towards deckhead. Mg pick-up by gas oil cargo negligible. For crude oil cargoes, corrosion most severe in tanks cleaned before ballasting, and least in non-ballasted compartments, because of waxy film. A. C.

1712. Catholic protection of pipelines and storage tanks. A. G. Thomson. *Petroleum, Lond.*, Feb. 1954, **17** (2), 54.—A review is given of Russian work on cathodic protection. At present the network of piping for petroleum products and gas mains in Russia exceeds 300,000 miles. G. H. G.

1713. Corrosion prevention for petroleum storage tanks. H. B. Footner. *Schweiz. Arch. angew. Wiss.*, 1954, **20**, 72–5.—Internal tank corrosion is mainly due to H_2O and O_2, stored product is rarely responsible. Scale and rust removal from outside plates is vital, methods available are weathering and wire brushing, sand blasting, flame treatment, de-rusting fluids, and acid pickling (dil H_2SO_4/60° C); latter is preferred, followed by phosphoric acid treatment, (2%, 90° C.) Paint should be 2 coats primer (Pb) and 2 finishing coats (Al),

latter should last 12 years in temperate climates. Tank bottom should rest on bitumen sand. Inner protection is lesser problem, 2 coats Pb primer should last 6–7 years. Inner tank bottom can, on each emptying, be coated with lime-containing cement mortar, which has a limited life. V. B.

1714. Rubber–bitumen mixtures for pipe insulation. H. A. W. Nijveld and J. G. Hirs. *Bitumen, Terre, Asphalte, Peche*, 1954, **5** (2), 31–3.—Comparative tests on various bitumens with and without rubber tyre scrap additions are reported. Heating to 200° C does not affect properties adversely. Shatter and compression test results are improved by small rubber additions. A test is described for assessing rubber scrap quality. R. T.

1715. Patents. U.S.P. 2,665,995 (26.5.50; 12.1.54). J. W. Bishop, assr to Tide Water Associated Oil Co. Rust-inhibiting composition comprising a non-corrosive vehicle and a minor amount of a hydrocarbon acid phosphate of an alkylol-containing amine having an alkylol group esterified with a hydrocarbon sulphonic acid (claimed in U.S.P. 2,666,034).

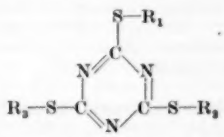
U.S.P. 2,667,408 (5.10.49; 26.1.54). M. P. Kleinholz, assr to Sinclair Refining Co. Light petroleum dist containing as rust inhibitor an oxide microcryst wax of 34–55 C atoms per mol consisting essentially of carboxy acids of sap No. 100–260, acid No. 70–160 and iodine No. <20.

U.S.P. 2,674,576 (26.10.51; 6.4.54). W. C. Keith, assr to Sinclair Oil and Gas Co. Introducing palm oil into the well fluid in an amount of *ca* 1–15 pints/1000 brl of well fluid to prevent corrosion.

U.S.P. 2,675,355 (7.7.51; 13.4.54). M. L. Lytle, assr to Standard Oil Development Co. A method for reducing the corrosiveness to corrosive ferrous metal of a corrosive petroliferous well fluid which comprises introducing into the fluid a corrosion-inhibiting amount of the reaction product of ebony fat derived from cotton-seed oil and triethanolamine bottoms.

U.S.P. 2.676,150 (9.4.52; 20.4.54). G. A. Loughran and E. O. Hook, assrs to American Cyanamid Co. Corrosion inhibitors for lub oils.

U.S.P. 2,676,151 (9.4.52; 20.4.54). G. A. Loughran and E. O. Hook, assrs to American Cyanamid Co. A hydrocarbon oil composition comprising a relatively large proportion of a hydrocarbon lub oil having dissolved therein a relatively small amount, sufficient to reduce the corrosive effect of the composition on metallic elements of an oil-soluble compound having the following structural formula:



in which each of R_1, R_2, and R_3 is an alkyl radical having from 1 to 18 C atoms, an allyl, aryl, or *cyclo*alkyl radical or hydrogen.

U.S.P. 2,676,660 (24.2.50; 27.4.54). A. M. Shook, assr to Texas Co. Corrosion prevention of offshore well tubing. D. A. R.

ENGINES AND AUTOMOTIVE EQUIPMENT

1716. Heat exchangers for internal combustion engines. H. E. Upton. *Trans. Inst. Mar. Engrs*, May 1954, **66** (5), 101.—The paper describes tubular heat exchangers used for the purpose of cooling engine coolants, lub oil, and the pressure charge air. The performance of these 3 heat exchange components has an influence on the efficiency of the engine while it functions as a machine for converting the heat in the fuel into shaft h.p. Information is given on heat distribution, the systems of which the heat exchangers form part, while the following aspects are also discussed: the closed system of engine cooling; oil coolers, their performance with reference to thermal instability and coring in low sea water temp; automatic temp control and valve arrangements; pressure charging and the effect of charge air cooling. The paper also examines details of design materials and general maintenance. 11 refs. T. T.

1717. Electronic gating knockmeter promotes combustion studies in full-scale engines. M. M. Adams. *Petrol. Engr*, Nov. 1953, **25** (16), C40.—The knockmeter permits studies in time interval and phase measurements, as well as the amplitude of signals of interest. The operation is described. Besides its use for routine automotive testing, other research programmes are greatly aided by this service. G. H. G.

1718. The measurement of engine wear by the use of radio-isotopes. Anon. *Petroleum, Lond.*, Dec. 1953, **16** (12), 358–61.—Useful life of I.C. engines is usually limited by the wear of cyl bores and piston rings. Straightforward weighing has defect that anomalously high wear rates occur for the first few hours of running following an engine strip. The other method is that of chemical analysis of the lub oil for iron. New procedure is to analyse the crankcase oil for radio-activity. Measurement of radio-activity and treatment of the piston ring is dealt with. Results obtained emphasize the importance of running-in effects, and much of the data obtained from stripping the engine is comparatively useless and may be misleading. The anti-wear effects of traces of additives have also been demonstrated. G. H. G.

1719. The Standard Eight. Details of the 803 c.c. engine. Anon. *Auto. Engr*, June 1954, **44** (6), 223.—This new engine design is fully described and illustrated. Main details of the specification are: 4 cyl; bore and stroke 58 mm × 76 mm; swept vol 803 cc; max b.h.p. 28 at 4500 r.p.m.; max b.m.e.p. and torque 120 p.s.i. and 470 lb/inch at 2800 r.p.m.; C.R. 7·0 : 1; 3-bearing crankshaft; overhead valves push rod operated; Solex downdraught carburettor; A.C. Delco diaphragm fuel pump. T. T.

SAFETY PRECAUTIONS

1720. Accident prevention. T. T. Maclean. *J. Inst. Petrol*, 1954, **40**, 156–8.—Methods of training workers in safety precautions are discussed, and some general aspects of the subject are presented. A. R. W. B.

MISCELLANEOUS

1721. National motor-gasoline survey, Summer 1953. O. C. Blade. *Rep. Invest. U.S. Bur. Min.* 5041, March 1954.—Analytical data are recorded for premium and regular grades of gasoline collected during June to Aug. 1953, and representing the products made by 131 refiners. Similar data for the previous years are given for comparison. Research and Motor method octane Nos. were : 91·1 and 82·9 respectively, for the premium grade, showing an increase of 0·5 and 0·7 over those for Summer 1952 ; and 84·2 and 79·3, respectively, for the regular grade, showing an increase of 0·6 and 0·9 over those for Summer 1952. The average volatility characteristics of both grades were not materially different from those of the preceding summer. W. H. C.

1722. Petroleum abstracts. Anon. *Petroleum, Lond.*, Dec. 1953, **16** (21), 350.—Survey of information in recent foreign oil journals—W. German oil in 1952, Italian fuel research 1952, and German research. G. H. G.

1723. Radio-telephone equipment in the German petroleum industry. F. Einfeld. *Erdöl u. Kohle*, 1954, **7**, 303–6.—Description of ultra short-wave sets for use on drilling rigs, etc. Allotted bands are 80 and 160 MHz, latter now being prescribed, with 50 KHz station separation. Frequency modulation is employed, standard set is of 10 W, connection to land-line phone circuits is provided. Recent developments include selective call and haversack sets of 0·4 W and 1–2 km range. V. B.

1724. Mobile research laboratory. R. C. Baird. *Petrol. Engr*, Nov. 1953, **25** (12), C29.—Mobile laboratory for making electronic measurements of a physical nature, principally in the field of acoustics and vibration. The laboratory is described, together with its development to measure and receive practically any physical quantity encountered in the petroleum and petrochemical industries. G. H. G.

1725. New test house for oil burning equipment development. Anon. *Petroleum, Lond.*, Jan. 1954, **17** (1), 5.—The test building contains a furnace and a shell boiler. Research facilities were developed mostly on the air flow side of oil burner design. Details of the equipment and instrumentation are given. G. H. G.

1726. Industry follows oil. Anon. *Petroleum, Lond.*, Jan. 1954, **17** (1), 13.—The refinery being built at Kwinana, W. Australia, will have far-reaching effects on the industrial development of that state. Besides the refinery, Kwinana will have a steel-rolling mill, a large cement works, and a factory manufacturing insulation materials within 5 years. G. H. G.

1727. Industrial petroleum chromatography. III. Evolution of petroleum chromatographic research (1935–53). Pt 3, Independent petroleum chromatographic research. H. Weil. *Petroleum, Lond.*, March 1954, **17** (3), 88–91.—A review of some of the historical and theoretical problems of petroleum chromatography. The 2 main groups are : (1) gas–solid, and (2) liq–solid studies. G. H. G.

1728. Administration of stores in the petroleum industry. R. C. H. Toye. *J. Inst. Petrol.*, 1954, **40**, 123–9.—The primary functions of a stores administration and guiding principles for organization and handling systems are discussed. The necessity for thorough training of staff is emphasized and a training scheme suggested. A. R. W. B.

1729. Recent developments in fuel cells. A. M. Adams. *J. Inst. Fuel*, July 1953, **27** (162), 366.—Progress in fuel cell research since 1945 in Britain, on the Continent, and in the U.S.A. is reviewed. Measurements of output of low-pressure hydrogen cells of the Davtyan type are reported. High-pressure hydrogen cells have been developed by Bacon. Improvements in methods of operating high-temp solid-electrolyte cells have been reported by Gorin. An investigation into high-temp cells is being made at Sondes Place Research Institute, and work is in progress at King's College, London, on low-temp oxidn–reduction cells.

It is concluded that only the Bacon cell is sufficiently developed to contemplate practical application yet awhile, and this would probably be initially to electric traction. D. K.

1730. Simplified drafting. A. H. Rau. *Mech. Engng, N.Y.*, June 1954, **76** (6), 491.—How industry can profit by the application of simplified draughting procedure and the educational and training problems involved are discussed. It is claimed that a 35% increase in drawing office productivity is possible. T. T.

1731. Solar energy for water- and space-heating. H. Heywood. *J. Inst. Fuel*, July 1954, **27** (162), 334.—Principles involved in heat collection in the utilization of solar energy and experiments made in the field of water- and space-heating are described. The first part of the paper deals with the factors affecting transmission of solar energy through the atmosphere. The fundamental principles of operation of the flat plate absorber are discussed. It is essentially a water-cooled metal surface, glass-covered on the front and thermally lagged at the back. It is usually placed on the roof of a house or building. Researches made on small scale absorbers at the Imperial College of Science and Technology and on an experimental water-heater at the author's home are also described. Heat storage and 3 designs of solar-heated houses built in the U.S.A. are considered. The paper is concluded with a discussion of the possible applications of solar energy to refrigeration and air-conditioning in tropical regions. 10 literature refs and a 5-page discussion are included. D. K.

ERRATA

The titles, etc, of Abstracts 716, 720, and 747 (June 1954 *Journal*) should be amended to read :

716. New products for drilling mud. M. J. Dupic. *Bull. Ass. franç. Tech. Petrole*, Nov. 1953, **102**, 51–69.

720. Drilling of Sensac 6. M. Antoinat, M. Samuel, and A. L. R. Thomas. *Bull. Ass. franç, Tech. Petrole*, Nov. 1953, **102**, 35–46.

747. Technical description and operating characteristics of the La Havre–Paris pipeline. M. J. Capdeville. *Bull. Ass. franç. Tech. Petrole*, Nov. 1953, **102**, 5–34.

BOOK REVIEWS

The Growth of Integrated Oil Companies. John C. MacLean and Robert William Haigh. Boston: Harvard Business School; London: Bailey Bros. and Swinfen, 1954. Pp. 728. 96*s*.

This volume, which is the work of two members of the Harvard Business School Faculty, is a study of "the process of progressive adaptation which has resulted in the gradual emergence of large integrated companies as the predominant form of business organization in the oil industry." The field of investigation is the U.S.A. The ambitious objective which the authors have set themselves has involved a tremendous amount of research. In fact, the writers pay tribute to the oil companies for their co-operation without which "the preparation of a book of this kind would have been impossible." In the event, they have produced a monumental study containing a mine of information and statistics relating to the oil industry in the U.S.A. and supporting the thesis that development within the industry has led to the emergence of large, integrated oil companies as the chief type of business structure.

The work falls into four main parts. The first examines the nature of the oil industry in 1950 and provides estimates of the degree of integration which existed in that year. Statistical data were collected from 106 companies which the authors affirm represented 59·2% of the total number of operating refinery companies and 94·7% of the refining capacity in the industry. Among the more interesting conclusions it is stated that "at least 48·6% of the total number of refining companies had some type of integrated structure." Furthermore, these companies "as a group held 68·3% of the refining plants and accounted for 93·2% of the capacity of the industry." There is nothing surprising about these magnitudes, but they do indicate what is already known, namely that "bigness" is a characteristic of the internal organization of the oil industry in the U.S.A. (and elsewhere).

Further conclusions which the statistics bear out are first, that "the share of the industry's facilities owned or leased by the integrated companies was greatest in the middle of the oil process" and, secondly, that "characteristically the integrated companies did not maintain an even balance in the different phases of the oil business." Finally, whilst the large refining companies were "exclusively of the highly integrated type," the small refining companies had "both integrated and non-integrated structures." This broadly is the structural pattern which the oil industry presented in 1950 in the U.S.A.

In the second part of the work the authors analyse the emergence of integration in the oil industry and develop a general theory as to what has caused the gradual emergence of the large integrated units. The rationale of this evolution has been economic. "The economic climate in the oil industry has been generally favourable to the integration process for a long period of time." In addition, there has been a lack of serious obstacles to integration in the oil industry.

One of the most significant of the general conditions favourable to integration was found "in the behaviour of profit opportunities." The authors' investigations show that gross margins and profits at the different levels of the oil industry have been continually changing and that movements at one level have frequently differed in both timing and direction from the movements at another. "By operating across two or more levels of the industry, oil companies have therefore been able to gain considerably in profit stability, to secure some protection from the short-term economic shocks developing from time to time in the individual parts of the business, and thus to strengthen their opportunities for growth and survival." Judged from this aspect, the impetus towards integration has been the healthy one of self-preservation.

A further set of general conditions favourable to integration was found in the economic characteristics of the physical facilities used in the oil process. Many of these facilities involve very large capital outlays, have highly specialized uses, and are extremely vulnerable to reductions in volume of throughout or output. Vertical integration, in fact, has been an important means of reducing the high degree of risk often attaching to investments in the oil industry.

Transitory conditions have also contributed towards the process of integration. Thus the vast crude oil discoveries of the late 1920s and early 1930s for a time caused many crude oil producers "to integrate forward" into refining and marketing activities to secure an outlet for their products. On the other hand, the petroleum shortages which followed the two world wars caused many marketers and refiners "to integrate backwards" to secure adequate sources of supply.

In the third part of the study the authors' purpose was "to determine the differences and similarities in the structures and policies of the companies and to study the character of the managerial process by which the companies have adapted their structures to changing external conditions." Seven oil companies provided the statistical data for analysis.

The authors draw a biological analogy between the adaptation which the oil companies have undergone in the economic world and that which living organisms undergo in relation to their physical environment. Whilst this artifice need not be taken too seriously, it has the merit of underlining the fact that the process of integration in the oil industry has been a completely natural one.

The more specific conclusions which the authors come to concerning the formation and alteration of integration patterns in the oil industry are too detailed to include here. But among the factors influencing integration are mentioned: investment, cost, and profit considerations; changes in economic, legal, and political conditions; managerial personalities; historical and accidental developments; changes in markets and products; and new technological discoveries. Management action in the shape of "individual decisions" rather than "general management strategies" has helped to further integration. The authors stress that a high degree of individualism and the working of effective competition characterize the growth of integrated business structures in the oil industry.

The fourth and final part of the work examines the changes which have occurred in the participation of small businesses in the refining segment of the industry during the period 1920–50 and the reasons underlying these changes. During this period the proportionate share of the industry's refining capacity held by small firms declined from about 28 to 15% of the total. In the words of the authors this decline "has been an appropriate and natural part of the evolution of the industry and could have been avoided only by placing strong, artificial restraints on the economic, technological, and competitive forces at work in the industry."

One of the most important factors contributing to the decline of the small firms has been the continued rapid advance in refinery technology, "which has made it necessary for the refiner to re-invest continually large sums in new plant facilities in order to maintain his operations on a competitive basis." Since the small refiners have not had as ready access to large amounts of new capital as the larger firms, it was inevitable that they should have suffered a loss in proportionate position.

Other factors working to the disadvantage of the small refiners were the oil conservation laws, which tended to remove the large quantities of cheap crude oil which had often created a field of opportunity for the small oilfield refiner; the very success which attended vertical integration as a means of meeting the risks associated with oil

industry operations; and the continuing pressure of competition. But the authors conclude that there are many profitable fields still open to small refiners, "*provided* that they select situations well suited to the financial and managerial resources at their command." M. D. G.

Hydrocarbons from Petroleum. Frederick D. Rossini, Beveridge J. Mair, and Anton J. Streiff. ACS Monograph 121. New York: Reinhold Publishing Corporation; London: Chapman & Hall, 1953. Pp. 556. 148*s*.

The publication summarizes the results of over twenty-five years of investigational work connected with the American Petroleum Institute's Research Project No. 6 and dealing with the fractionation, analysis, isolation, purification, and properties of petroleum hydrocarbons.

In this quite remarkable compilation, the atmospheric, reduced pressure, and azeotropic features of distillation are covered by five chapters, while a further three deal with the theoretical aspects of extraction, adsorption, and crystallization. Analytical considerations form a very large and important part of the book, and include boiling points, vapour pressure, density, refractive index, freezing point, molecular weight, and carbon and hydrogen determination. After a very useful chapter on the purification of hydrocarbons, the authors proceed to deal with the analysis of petroleum and its products under nine headings, ranging from crude oil to alkylates, codimers, and hydrocodimers.

This is, in the reviewer's opinion, perhaps one of the most useful books of its type which have appeared in recent years, not only from the point of view of the excellent summarizing which has been done but also that of the references provided, the tabulated data, and the very clear diagrams and graphs. Indeed, with such well known authors and workers in the field of petroleum chemistry, it hardly appears necessary to stress the value of the book to all those engaged in the study and application of hydrocarbon chemistry. W. H. T.

ADDITIONS TO THE LIBRARY

Bibliography of Books and Published Reports on Gas Turbines, Jet Propulsion, and Rocket Power Plants. January 1950 through December 1953. E. F. Fiock and C. Halpern. *Supplement to NBS Circular* 509. Washington, D.C.: U.S. Government Printing Office, 1954. Pp. 110. 50 cents.

This supplement to NBS Circular 590 of 1951 extends the period covered by this bibliography to the end of 1953, gives additional coverage on 1950, and includes references to publications of earlier date which have since been declassified. Over 5000 additional references are listed. The first section lists books, and the second, which occupies all but four pages of the book, relates to periodical literature. The references are entered in chronological order under subject headings or sub-headings.

The Organization of Applied Research in Europe, the United States, and Canada. Paris: OEEC, 1954. London: HMSO. Vol. I, 80 pp, F. Fr. 300, 6*s*.; Vol II, 192 pp. F. Fr. 600, 12*s*.; Vol. III, 120 pp, F. Fr. 400, 8*s*.

This is the report of Technical Assistance Missions 81, 82, and 83, which have studied the organization of applied research in Western Europe and North America and its contribution towards raising production and increasing national wealth. Pt I compares the two main areas, Pt II reviews the position in Western Europe, and Pt III deals similarly with the U.S.A. and Canada.

Volumetric Glassware. NPL Notes on Applied Science No. 6. London: HMSO, 1954. Pp. 21. 1*s*. 6*d*.

The object of these "Notes on Applied Science" published by the National Physical Laboratory is to provide information on various scientific and technical subjects not readily available elsewhere. The present booklet deals with information needed for the preparation of standards for volumetric glassware in three main sections—Basis of graduation; Construction and verification of apparatus; Dependence of volume delivered on delivery procedure.

Production of Natural Gas Substitutes by Pressure Hydrogasification of Oils. H. R. Linden, J. J. Guyer, and E. S. Pettyjohn. Institute of Gas Technology Interim Report. Chicago, Ill.: The Institute, 1954. Pp. 36 + iv. $2.50.

The results of a laboratory study of the effects of pressure and feed hydrogen in high-BTU oil gas production. Three typical gas-making oils—diesel oil, reduced crude, and Bunker C—were employed in tests at gasification pressures of 1–5 atm, cracking temperatures of 1350°–1550° F, residence times of 2·5–10·5 sec, and hydrogen–oil feed ratios of 0–90 SCF/gal.

Data on the substitutability of the gases for high-methane natural gas are reported, and burner test results are related to gas composition. The combustion tests were conducted at approximately rated burner heat inputs using the five critical appliance burners employed in previous studies of oil gas–natural gas substitutability.

These data, with the Institute's previously published studies of high-BTU oil gas production, provide a basis for application of the novel pressure hydrogasification process to the design of plants for the production of complete natural gas substitutes.

Fuel Research 1953. London: HMSO, 1954. Pp. 62 + vi. 2*s*. 6*d*. net.

This is the Report of the Fuel Research Board of the Department of Scientific and Industrial Research and the Report of the Director of Fuel Research for 1953.

In dealing with the synthesis of oils and chemicals from coal, it is pointed out that the continued study at the Fuel Research Station of the Fischer–Tropsch process ensures that firsthand and up-to-date knowledge is readily available to the U.K. and the Commonwealth. Particular attention has been paid to effect of changes in feed gas composition and a pilot-scale reactor has been built for investigation of the slurry process. A successful 15-day run was made using fluidized catalyst technique.

In co-operation with the Admiralty, the thickening of fuel oils during storage was investigated and an artificial ageing method developed. By a heating–cooling–heating cycle, the flow properties of fuel oil can be made to simulate those acquired after bulk storage. The internal structures of naturally and artificially aged oils are under examination.

The report contains much other information likely to be of value to the fuel technologist.

British Standards:

B.S. 192: 1954. Open-Ended Spanners (not including B.A. Sizes). Pp. 27. 5*s*. net, post free.

B.S. 1414: 1954. Flanged Steel Outside Screw-and-Yoke Wedge Gate Valves for the Petroleum Industry. Pp. 33. 10*s*. net, post free.

B.S. 2469: 1954. Round Tins for Lubricating Greases. Pp. 8. 2*s*. net, post free.

B.S. 2470: 1954. Hexagon Socket Screws and Wrench Keys. Pp. 22. 4*s*. net, post free.

B.S. 2499: 1954. Tests to Assess the Properties of Hot Applied Joint Sealing Compounds for Concrete Pavements. Pp. 25. 4*s*. net, post free.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1732. Application of the method of indices to the study of the Vilaine basin sediments. L.-R. Lafond. *Rev. Inst. franç. Pétrole*, Special Number 1953, **8**, 108–10.—The size distribution curves (cumulative semi-log) show a progressive change in form from parabolic to logarithmic. The latter form is found only for fine muds towards the end of the estuary. The indices of evolution, facies, and class permit the history of the materials to be followed closely, and certain apparent anomalies to be explained. The indices have been studied as a function of distance along the course of the river. The index of facies decreases in going from Upper Vilaine in proportion to the diminution in the competence of the transport. The class index at first decreases and then rises in the estuary, while the index of evolution decreases. It appears that the methods may be applied to fossil sediments, and hold-up by a lake, or issue into an estuary may be marked by a discontinuity or change in gradient of an index.

G. D. H.

1733. Method of interpreting the granulometry of sediments. A. Rivière. *Rev. Inst. franç. Pétrole*, Special Number 1953, **8**, 102–7.—A study of the forms of cumulative semi-log size distribution curves shows 3 broad types—concave upwards for certain incompletely evolved fluviatile sediments, almost straight for evolved fluviatile sediments and numerous estuarine, lagoonal, and marine muds, and concave downwards for certain fine, pure ceramic kaolins. A spread of curves which includes these types and intermediate forms can be derived by plotting an expression of the form $y = \int ax^n\,dx$, where x is the size and y the cumulative percentage. If $0 > n > -1$ the curves have the first form and the facies is described as parabolic; if $n = -1$ the curve is of the second type, giving the so-called logarithmic facies, if $-1 > n > -2$ the curves are of the third type and the facies is said to be hyperbolic. The parabolic type is the facies of aggradation, the logarithmic type indicates long evolution by transport, while the hyperbolic type is indicated as fine deposits involving decantation in still waters. The logarithm of the ratio of the dia of the largest and smallest grains is g, the class index, while the index of facies is $g\,(n + 1)$. G. D. H.

1734. New examples of the use of sequence analysis in the interpretation of well sections. Y. Jullian. *Rev. Inst. franç. Pétrole*, Special Number 1953, **8**, 46–50.—The wells studied are not far from the Camargue in the plain of the lower Rhône. The beds investigated are in the Oligocene, and include sandstones, limestone, marls, salt anhydrite, etc. Coring has given the lithological sequence in great detail, but the detail tends to mask the broad trends. The γ-ray log for the sequence has been compared with a plot showing the rock type arranged in the sequence red sandy marl, green marl, marl–limestone, limestone–limestone and anhydrite, and anhydrite–salt. The major and subordinate envelopes of the oscillations in the values of the γ-radiation revealed certain trends and rhythms, in spite of the complexities of the detailed lithological data.

This technique permitted lateral variation in the facies to be detected and the lenticular nature of certain sequences to be defined. It has also been possible almost completely to eliminate coring and depend on drilling cuttings, thereby saving time and money. G. D. H.

1735. The need to study the bulk properties of sediments to determine the facies. J. Bourcart. *Rev. Inst. franç. Pétrole*, Special Number 1953, **8**, 100–1.—Most sediments are preserved in water, or have been transported and deposited in water. The bulk properties should be studied in sediments which have their original water, but consideration must also be given to their behaviour as regards external waters. Sol and gel states occur, and Atterberg's liq limit is significant in this connexion. There are sensitive sediments in which the water is partly included and partly bound. Sensitive sediments are frequently thixotropic. Visc is involved in turbidity currents and mud flows. Adsorption, cohesion, and capillarity are other properties of interest, while the electrical charges associated with particles and their enveloping films may determine the behaviour of certain sediments.

G. D. H.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1736. Early arrivals in seismic prospecting. F. F. Evison. *Nature, Lond.*, 1954, **173**, 1047.—No useful information can be obtained from seismic records showing vibrations propagated from a dynamite explosion during the first 0·1–0·2 sec after the initial onset. To study shallow prospecting problems an electromechanical seismic source has been developed, which affords more control over the generated impulse.

In a practical test the first arrival was recorded after 40 millisec, and second and third arrivals in a further 50 millisec, with a large fourth arrival some 40 millisec later. A disadvantage of the apparatus is its large bulk and low power.

H. C. E.

1737. Patents. U.S.P. 2,674,885 (17.8.49; 13.4.54). D. Silverman, assr to Stanolind Oil and Gas Co. A motion compensator for a gravity-measuring system.

U.S.P. 2,674,886 (17.8.49; 13.4.54). J. F. Evans, assr to Stanolind Oil and Gas Co. A self-levelling mounting for a gravity meter.

U.S.P. 2,674,887 (8.12.47; 13.4.54). S. P. Worden, assr to Texas Instruments Inc. Gravity meter.

U.S.P. 2,675,086 (3.5.48; 13.4.54). D. H. Clewell, assr to Socony-Vacuum Oil Co. Method and apparatus for seismic prospecting.

U.S.P. 2,675,533 (26.3.51; 13.4.54). R. R. Brown, assr to Phillips Petroleum Co. Seismometer.

U.S.P. 2,675,882 (12.11.49; 20.4.54). C. B. Bazzoni and L. G. Ellis, assrs to Sun Oil Co. Seismographic prospecting by providing through an area of the surface of the earth an array of elongated cord-like explosive involving an arrangement of the explosive in substantially spiral form to provide time displacement of explosion between the central and peripheral portions of the area, producing a progressive explosion through the area by firing the cord-like explosive and producing thereby a non-planar wave front, and detecting reflected seismic waves produced by the explosion.

U.S.P. 2,678,397 (21.10.50; 11.5.54). G. Herzog, assr to Texas Co. Method of and apparatus for exploring radioactive strata.

U.S.P. 2,678,398 (19.3.51; 11.5.54). G. Herzog, assr to Texas Co. A geophysical survey involving the detection from an aircraft in flight of the intensity of natural γ-radiation emitted from the terrain along the course of the aircraft.

U.S.P. 2,678,399 (3.12.51; 11.5.54). C. H. Fay, assr to Shell Development Co. Measurement of radiation absorption.

U.S.P. 2,679,205 (10.2.49; 25.4.54). R. G. Piety, assr to Phillips Petroleum Co. Method of and apparatus for producing seismic waves. D. A. R.

DRILLING

1738. Physical examination of boreholes. H. Zierfuss. *Ingenieur, 's Grav.*, 11.6.54, **66** (24), M9–4.—A short description is given of the measurement and logging of some physical properties, such as electrical resistivity, electrical potentials, radio-activity, and fluorescence, and the pros and cons of each method indicated. From such logs data can be derived which are used in the completion of wells and which are of prime importance for the rational exploitation of an oil reservoir. The paper includes 7 figs and 20 refs. G. F. T. C.

1739. Effect of high temperatures and pressures on cements. M. A. Swayze. *Oil Gas J.*, 2.8.54, **53** (13), 103.—A new test procedure for oilwell cements has been developed to furnish a more realistic evaluation of actual in-the-well performance. One table and 7 figs are given. G. A. C.

1740. Patents. U.S.P. 2,674,190 (3.5.52; 6.4.54). W. G. Taylor, assr to General Electric Co. Pumping apparatus for abrasive slurry.

U.S.P. 2,674,379 (23.3.48; 6.4.54). J. N. Gregory, assr to Shell Development Co. Drill pipe racking chute.

U.S.P. 2,674,439 (12.11.48; 6.4.54). L. S. Chambers. Formation tester.

U.S.P. 2,674,440 (26.2.51; 6.4.54). H. T. Donovan, assr to Phillips Petroleum Co. Process for drilling wells, including dialysis of the drilling mud.

U.S.P. 2,674,441 (20.5.49; 6.4.54). J. C. Curtis, assr to Joy Manufacturing Co. Self-supporting stopper rock drill.

U.S.P. 2,674,575 (16.3.51; 6.4.54). H. F. Lewis and M. A. Buchanan, assrs to Pacific Lumber Co. An aq drilling mud made up of a major proportion of water insoluble clay material and characterized by the presence of a minor proportion of alkali metal sulphite-digested redwood bark solubles sufficient to reduce the visc, gel-strength, and/or water losses of the aq drilling mud.

U.S.P. 2,675,122 (22.11.49; 13.4.54). C. Parsons, assr to Engineering Development Co. Oil well drilling installation.

U.S.P. 2,675,352 (31.3.50; 13.4.54). R. D. Dawson, assr to Shell Development Co. An oil-containing drilling fluid for wells, comprising a substantial quantity of an oil, a plastering agent, a finely divided solid material dispersed in the fluid for weighting the fluid to between 80 and 140 lb/cu. ft., and a combination of 2 polyvalent metal soaps of dissimilar acids, one of the soaps being from 0·1 to 2·0% by wt of a trivalent metal soap of a high mol. wt. fatty acid, the other of the soaps being from 0·4 to 5% by wt of a soap of a resin or a resin residue.

U.S.P. 2,675,353 (20.10.50; 13.4.54). R. D. Dawson, assr to Shell Development Co. An oil-containing drilling fluid for wells, comprising a substantial quantity of a mineral oil, a finely divided solid material dispersed in the fluid for weighting the fluid to at least 75 lb/cu. ft., and a minor amount of a tetra-alkyl ammonium halide having at least one of the alkyl radicals with a chain length of at least 12 carbon atoms, the minor amount being sufficient to stabilize the drilling fluid and maintain it at a drilling visc.

U.S.P. 2,675,357 (9.3.50; 13.4.54). O. L. Brandes and C. B. Pattinson, assrs to Gulf Research and Development Co. Flushing compositions.

U.S.P. 2,675,874 (15.5.50; 20.4.54). A. L. Springer. Well apparatus with sleeve valve.

U.S.P. 2,675,875 (12.5.51; 20.4.54). E. L. Potts, assr to Cicero C. Brown. Pressure equalizing valve for well strings.

U.S.P. 2,675,876 (6.1.50; 20.4.54). M. B. Conrad and E. H. Clark, Jr, assrs to Baker Oil Tools Inc. High-pressure well packer.

U.S.P. 2,675,877 (12.1.48; 20.4.54). J. R. Baker, assr to Baker Oil Tools Inc. Subsurface well apparatus with gas expansion retarding device.

U.S.P. 2,675,878 (27.9.52; 20.4.54). R. R. MacGregor. Bridging and heaving plug.

U.S.P. 2,675,879 (21.4.52; 20.4.54). W. H. Middleton and V. D. Miller, assrs to R. Bird and to V. D. Miller. Fishing tool for use in deep wells.

U.S.P. 2,675,995 (27.2.48; 20.4.54). C. E. Geiser. Well-drilling rig.

U.S.P. 2,676,075 (25.10.50; 20.4.54). A. L. Stone, assr to Standard Oil Development Co. Piston for slush pumps.

U.S.P. 2,676,147 (16.11.51; 20.4.54). R. P. Mulligan, assr to Texaco Development Corpn. A mud-laden aq drilling fluid containing starch and an additive comprising tetra-phenyl silicate or a homologue thereof in which the phenyl group may be substituted by no more than 2 methyl groups, the additive being present in sufficient amounts to inhibit fermentation thereof.

U.S.P. 2,676,787 (22.6.49; 27.4.54). H. L. Johnson. Drilling equipment for submarine wells.

U.S.P. 2,676,789 (20.3.53; 27.4.54). T. W. Stringfellow. Connector for the spinning line and jerk line of oil well rigs comprising link chains interposed.

U.S.P. 2,676,790 (10.11.48; 27.4.54). M. F. Turner, assr to Turner Bits Inc. Rock bit.

U.S.P. 2,676,820 (24.9.51; 27.4.54). E. G. Boice, assr to Reed Roller Bit Co. Drill collar.

U.S.P. 2,676,786 (18.7.52; 27.4.54). R. L. Grisell. Well tool jack.

U.S.P. 2,677,790 (5.12.51; 4.5.54). J. J. Arps. Borehole logging by intermittent signalling.

U.S.P. 2,677,996 (19.11.51; 11.5.54). C. Laval. Borehole camera apparatus.

U.S.P. 2,678,190 (23.6.51; 11.5.54). W. S. Crake, assr to Shell Development Co. Oil well hoist.

U.S.P. 2,678,203 (31.5.46; 11.5.54). L. C. Huff, assr to Universal Oil Products Co. Hydraulic jet cutting and pumping apparatus for mining hydrocarbonaceous solids.

U.S.P. 2,678,696 (24.4.51; 18.5.54). W. S. Crake, assr to Shell Development Co. Paraffin scraper for wells.

U.S.P. 2,678,697 (4.2.52; 18.5.54). P. M. Fischer, assr to Union Oil Co. Method and composition for protecting well casings.

U.S.P. 2,678,804 (9.6.44; 18.5.54). M. P. Lebourg, assr to Schlumberger Well Surveying Corpn. A projectile for sampling formations traversed by a borehole.

U.S.P. 2,678,805 (20.2.50; 18.5.54). W. N. Sutliff. Hydraulic well jar.

U.S.P. 2,678,806 (25.9.41; 18.5.54). C. C. Brown. A device adapted to be interposed in a pipe string in well bore operations.

U.S.P. 2,678,920 (16.11.51; 18.5.54). O. L. Brandes and C. B. Pattinson, assrs to Gulf Research and Development Co. A flushing composition consisting essentially of a homogeneous mixture of *ca* 5 to *ca* 60% by wt of *iso*propylphenol; *ca* 10 to *ca* 60% by wt of a mineral lub oil; *ca* 5 to *ca* 40% by wt of a water-soluble metallic soap of a fatty acid, the soap containing *ca* 20 to *ca* 60% by wt of water; and water in an amount sufficient to produce a flushing composition having a total water content between *ca* 2 and *ca* 30% by wt.

U.S.P. 2,679,161 (3.11.49; 25.5.54). J. E. Yancey. Depth progress recording apparatus for wells.

U.S.P. 2,679,182 (26.8.42; 25.5.54). R. R. Proctor and D. J. Wangelin, assrs to Pure Oil Co. An apparatus for making fluid intrusion studies of a well bore wherein water is being injected into a plurality of strata.

U.S.P. 2,679,380 (8.10.48; 25.5.54). W. G. Sweetman. Apparatus for advancing well bores by explosives.

U.S.P. 2,679,381 (28.12.50; 25.5.54). S. H. Royer, E. A. J. Miller, and R. F. Hinschlager, assrs to Union Carbide and Carbon Co. Thermal rock piercing apparatus with automatic control.

U.S.P. 2,679,382 (Germany 2.1.50; 25.5.54). A. S. Schmidt assr to Hermann Hemscheidt Maschinenfabrik. A circular hollow rock drill head having a bit portion at one end, the bit portion being tapered at its forward end to form a transverse cutting edge.

U.S.P. 2,679,383 (23.10.50; 25.5.54). M. A. Garrison, assr to Regan Forge and Engineering Co. Wall scraper for deep wells.

U.S.P. 2,679,478 (4.1.47; 25.5.54). P. W. Fischer and R. A. Rogers, assrs to Union Oil Co. A drilling fluid comprising water, clay, and between *ca* 0·01 and 10% by wt of water-dispersible methyl cellulose. D. A. R.

PRODUCTION

1741. Patents. U.S.P. 2,674,126 (28.4.50; 6.4.54). C. J. Coberly, assr to Dresser Equipment Co. Fluid-operated free pump with formation pressure tester.

U.S.P. 2,674,192 (25.11.49; 6.4.54). C. J. Coberly, assr to Dresser Equipment Co. Well pumping system with gas separator.

U.S.P. 2,674,198 (7.12.51; 6.4.54). C. P. Howe. Method of pumping oil under pressure without the loss of gas.

U.S.P. 2,674,199 (12.3.48; 6.4.54). J. S. Page, assr to Page Oil Tools Inc. Apparatus for holding tubing in wells.

U.S.P. 2,674,200 (7.12.51; 6.4.54). C. P. Howe. Casing pump drain valve.

U.S.P. 2,674,201 (29.1.51; 6.4.54). G. E. Talbott, assr to Shell Development Co. Apparatus adapted to be lowered on a wire line into a well for operation as a combination well swab and as a jar.

U.S.P. 2,674,202 (12.5.52; 6.4.54). K. Kelley and A. Kelley. Stage lift apparatus for wells.

U.S.P. 2,674,313 (7.4.50; 6.4.54). L. S. Chambers. Device for obtaining samples of the fluid contents of formations traversed by a borehole containing a column of liq.

U.S.P. 2,674,314 (27.11.48; 6.4.54). R. C. Baker and M. B. Conrad, assrs to Baker Oil Tools Inc. Device for rendering subsurface well apparatus inoperable.

U.S.P. 2,674,315 (17.9.49; 6.4.54). C. C. Brown. Differential pressure well packer.

U.S.P. 2,674,316 (18.9.48; 6.4.54). M. O. Johnston, assr to Johnston Testers Inc. By-pass packer.

U.S.P. 2,674,317 (17.11.49; 6.4.54). S. A. Kipper, assr to K. A. Wright. Scratcher for wells.

U.S.P. 2,674,318 (1.6.51; 6.4.54). W. N. Sutliff. Wire line bailer for picking up junk in oil well bores.

U.S.P. 2,674,319 (20.2.51; 6.4.54). R. W. Johnston, Jr, assr to Texas Co. The production of liq hydrocarbons from a producing well extending into a porous producing formation containing a non-wetting oil phase and a wetting phase of capillary formation water a substantial distance above a water table.

U.S.P. 2,674,320 (12.12.49; 6.4.54). H. G. Cutforth, assr to Phillips Petroleum Co. Process of cementing a well which extends into a porous formation which comprises placing a hydraulic cement aq slurry having an increased thickening time by admixing with hydraulic cement from 0·1 to 3% of a specified sulphobenzyl compound.

U.S.P. 2,674,321 (19.12.49; 6.4.54). H. G. Cutforth, assr to Phillips Petroleum Co. Low water-loss cement slurry.

U.S.P. 2,674,322 (23.8.51; 6.4.54). P. H. Cardwell, assr to Dow Chemical Co. Method of treating an incompetent earth formation so as to cement together the loose earth particles without blocking the interstices to fluid flow.

U.S.P. 2,674,323 (23.8.51; 6.4.54). P. H. Cardwell, assr to Dow Chemical Co. Method of preventing earth particles from being carried into a well bore in an incompetent earth formation.

U.S.P. 2,674,699 (11.2.50; 6.4.54). F. S. Phillips, assr to Schlumberger Well Surveying Corpn. Radio-activity detecting apparatus.

U.S.P. 2,674,877 (1.7.50; 13.4.54). D. Silverman and E. Hartline, assrs to Stanolind Oil and Gas Co. Well productivity measurement.

U.S.P. 2,674,880 (25.4.52; 13.4.54). C. K. Broderson, assr to Shell Development Co. Variable area flowmeter.

U.S.P. 2,674,951 (22.3.50; 13.4.54). J. Zaba, assr to Stanolind Oil and Gas Co. Gas lift plunger.

U.S.P. 2,674,955 (29.4.49; 6.4.54). L. D. Hilton. Reciprocating piston pump with valved piston.

U.S.P. 2,674,956 (18.10.48; 6.4.54). L. D. Hilton. Fluid lift pump rod and piston.

U.S.P. 2,675,080 (10.12.49; 13.4.54). P. S. Williams, assr to Standard Oil Development Co. Oil well formation tester.

U.S.P. 2,675,081 (23.10.50; 13.4.54). T. J. Nowak, assr to Union Oil Co of California. Method and apparatus for pumping and heating oil wells.

U.S.P. 2,675,082 (28.12.51; 13.4.54). J. A. Hall. Method for cementing oil and gas wells.

U.S.P. 2,675,083 (8.9.49; 13.4.54). D. C. Bond and G. G. Bernard, assrs to Pure Oil Co. Increasing production from oil and gas wells.

U.S.P. 2,675,263 (1.6.50; 13.4.54). J. R. Jennings and R. Donnell. A tool for recovering objects from a well.

U.S.P. 2,675,880 (28.6.48; 20.4.54). A. A. Baker, assr to Baker Oil Tools Inc. Perforation washing apparatus.

U.S.P. 2,675,881 (19.8.50; 20.4.54). P. H. Cardwell, assr to Dow Chemical Co. Treating permeable earth formations.

U.S.P. 2,676,661 (4.1.51; 27.4.54). H. H. Crooke, Jr. Pressure releasing valve for test pipes.

U.S.P. 2,676,662 (17.5.49; 27.4.54). O. F. Ritzmann, assr to Gulf Oil Corpn. Method of increasing the productivity of wells.

U.S.P. 2,676,489 (2.10.50; 27.4.54). R. B. Basham, assr to Westronics Inc. Apparatus for measuring temp in boreholes.

U.S.P. 2,676,488 (15.8.49; 27.4.54). J. S. Wilcox, assr to Technical Instrument Laboratory, California. Quantitative flow indicator. D. A. R.

TRANSPORT AND STORAGE

1742. Modern pipelining—to-day and to-morrow. Pt I. A. H. Newberg and E. C. Schuster. *Pipe Line News*, Apr. 1954, **26** (4), 33–6.—Modern pipeline is 20–30 inches dia, fed by pumping stations approx 100 miles apart having pumps of 10,000 h.p. Automatic control is widespread, and unattended booster stations are coming into service. The modern design is based on as adequate an economic survey as possible, and design trends are towards the use of larger pipe with thinner walls. Alloy steel pipes are not extensively used. Manifold design is towards simplification, with all pipes and fittings above ground. Many pipelines use electric prime movers coupled to centrifugal pumps, and the gas turbine is finding application. Newly developed dual- and tri-fuel spark ignited engines and packaged units now compare favourably with electric motors. B. A. F.

1743. Simultaneous flow of oil and gas. O. Baker. *Oil Gas J.*, 26.7.54, **53** (12), 185.—Research work is reported by Magnolia Petroleum Co and Continental Oil Co on 2-phase pipeline design, and showed that pressure drops for large pipes resulting from reduced cross-sectional area available for gas flow because of liq accumulation was 40–60% less than predicted figure. Types of flow studied included slug, annular, froth or bubble, plug, wave, and stratified flows. A brief economic survey of a 2-phase versus 2 single-phase lines showed that savings in operating costs favoured installation of 2-phase lines in new fields. Tables give experimental data. G. A. C.

1744. Proving high-capacity pipeline meters. R. E. Speckmann and M. L. Barrett. *Oil Gas J.*, 9.8.54, **53** (14), 84.—A description is given of the Shell Oil Co high-capacity meter-proving system, which has been in operation about a year. The meters are rated at a capacity of 1850 brl/hr, but can be successfully operated at a 50% higher flow rate. Scraper launching and receiving facilities supplement the system. Schematic figures show meter-proving section with scraper barrels, mechanical scraper detector, solenoid-actuated meter register and clutching mechanism, and electrical circuit for prover section. A table gives values of compressibility factor, p.s.i. G. A. C.

1745. Photogrammetry. J. H. Mitchell. *Oil Gas J.*, 2.8.54, **53** (13), 93.—The economics of the photogrammetric methods in connexion with pipeline construction are discussed. Advantages include accomplishment of more efficient ground survey, land procurement with less waste of time, and detailed route projection independent of weather and travelling conditions. G. A. C.

1746. Permian basin on stream. B. Quarles. *Pipe Line News*, Apr. 1954, **26** (4), 29–32.—The new pipeline supplies Midwest States with gas from the West Texas Basin, the San Juan Basin, New Mexico, and from producers in the Lea County, New Mexico, area. Use was made of 203 miles of existing line from Denver City–Dumas area to Lea County. The remaining 234 miles of line were laid in rocky soil, making ditching difficult. Details of the pipe and ditching specifications are given. B. A. F.

1747. Gas line from Janja-Lipa to Zagreb. J. Terzic. *Nafta* (*Yugoslavia*), 1954, **5** (4), 97–102.—This article is based on a statement of natural gas reserves in Janja-Lipa, and deals with the construction of the gas line from Janja-Lipa to Zagreb designed by the Institute of Petroleum, Zagreb. One secondary line is to be branched-off from the main at Poporača and led to the rolling mill at Lisak to ensure gas supply for the production of first-class steel pipe. The author also points out the advantages of domestic and industrial gas supply to Zagreb and the neighbouring villages.

(Author's Abstract.)

1748. Operation Webfoot. E. Sterrett. *Pipe Line News*, March 1954, **26** (3), 33–8.—160 miles of 20-inch pipe was laid in swamp or open water from specially designed barges. A canal, 40 ft wide, was dredged to a depth 6 ft below normal low tide. The pipe bed was dredged in the bottom of the canal, and the trench left open for inspection and maintenance. Corrosion protection was extremely important, and the coating consisted of a primer and 2 enamel coats, with glass wraps pulled into the hot enamel. Concrete was applied to give added protection and the necessary weighting. The coated pipe was welded on to the string on the barges, and the joints were X-rayed, coated, and the pipe then laid into the trench. B. A. F.

1749. Lasting protection for products pipelines. S. Kleinheksel, P. Lawrence, and F. L. Nelson. *Oil Gas J.*, 12.7.53, **53** (10), 94.—Field experiences in the use of an oil-soluble anti-rust agent show that a products pipeline can be protected from internal corrosion indefinitely, rust lifting in badly corroded lines can be prevented by suitable precautions, and a high C factor is maintained without scraping. Field experiences with 4 pipelines are given. G. A. C.

1750. Streamlined internal cleaning—coating operation. F. L. Resen. *Oil Gas J.*, 28.6.54, **53** (8), 112.—A new unit consisting of a rotating head driven by a hollow shaft 50 ft in length has been developed to clean the internal surface of pipe joints on one pass and spread a corrosion-resistant protective coating on the reverse pass. The rotating head is made up of a wire-brush cleaner with 3 spray guns mounted at the end. Use of the device results in increased throughput and protection against corrosion. G. A. C.

1751. New scraper detector offers operational advantages. S. E. Hood. *Oil Gas J.*, 5.7.54, **53** (9), 161.—A mechanical scraper detector of new design is described, which when placed upstream from a station automatically shuts the station down. Another detector downstream from the station gives a positive indication that the scraper has passed; thus station shut-down time is reduced to a minimum. G. A. C.

1752. How Sinclair prepares pipeline for product service. L. B. Moon. *Oil Gas J.*, 5.7.54, **53** (9), 137.—The 5-point programme of Sinclair Pipe Line Co is described for inspection, testing, and maintaining products pipelines in high efficiency. Each joint is swabbed before welding, every 5- to 15-mile length is air-pressure tested after welding, completed line tested hydrostatically, pre-surfaced, and cleaning achieved by series of scraper passes, and a periodic in-service cleaning programme is carried out. G. A. C.

1753. Importance of maintaining proper valve lift on compressor valves. A. R. Worster. *Pipe Line News*, Apr. 1954, **26** (4), 26–8.—Valve lift determines efficiency and durability of valves. The factors involved in design include: general type of valve and spring, rotative speed, gas speed, pressure, and characteristics. Valve lift depends mainly on the rotative speed, and may vary from 0·200-inch lift at 300 r.p.m. to 0·040-inch at 1800 r.p.m. Cushioning, especially of discharge valves, increases the valve life. In service it is important to maintain proper lift. B. A. F.

1754. Blower stage loading. L. J. Williams. *Pipe Line News*, Apr. 1954, **26** (4), 23–5.—On starting up, the seal oil pump is started, the Cash regulator ensuring a 40-p.s.i. differential pressure across the seal. Simultaneously the blower case is pressured, with suction and discharge valves closed, until line pressure is established. Suction, discharge, and by-pass valves are opened and the unit brought up to

speed. At approx 3000 r.p.m. the by-pass valve may be closed and the unit put on the line and brought up to speed. Additional units must be brought up to the speed of the operating unit before the by-pass is closed. On removing a unit from service the safety switches are de-energized, the units slowly reduced in speed, until on opening the by-pass and cutting out the redundant unit the others may be speeded up to give the same overall differential pressure. B. A. F.

1755. Possible use of slate pits for oil storage. Anon. *Petroleum, Lond.*, Apr. 1954, **17** (4), 119–20.—Plans are being considered to utilize abandoned slate pits in NE. Pennsylvania as underground reservoirs for the seasonal storage of domestic heating oil. G. H. G.

1756. Patents. U.S.P. 2,674,128 (4.5.50; 6.4.54). J. W. Beam, assr to Deep Rock Oil Corpn. A tank gauging system for determining the level of a liq in a tank.

U.S.P. 2,674,129 (29.3.52; 6.4.54). W. D. Cannell. Bottom level tank sampler.

U.S.P. 2,674,189 (4.1.52; 6.4.54). K. R. Lung, assr to Dayton Pump and Manufacturing Co. Pumping system and method of operation.

U.S.P. 2,675,093 (3.10.49; 13.4.54). A. B. McCall. A filtering cap assembly adapted for attachment to the inlet opening of a gasoline tank.

U.S.P. 2,675,682 (G.B. 9.1.52; 20.4.54). L. Dobson, assr to I.C.I. Ltd. A movable tank for transporting substantial quantities of liq ethylene in bulk at temp below *ca* −50° C and pressures not in excess of 20 atm.

U.S.P. 2,675,702 (6.3.50; 20.4.54). J. R. Buck, assr to Socony-Vacuum Oil Co. A system for measuring flow of fluid at a point remote from a measuring location.

U.S.P. 2,675,824 (G.B. 11.2.52; 20.4.54). R. F. Worlidge, assr to Flight Refuelling Ltd. A valve for controlling a unidirectional flow of fluid in a conduit.

U.S.P. 2,676,622 (28.10.52; 27.4.54). C. H. Fox, assr to Pure Oil Co. Stream divider for proportioning the flow of liq. D. A. R.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1757. Refinery at Coryton. Anon. *Petrol. Times*, 11.6.54, **58** (1483), 583.—A general description is given of the new lub oil plant of the Vacuum Oil Co, recently opened by H.M. The Queen Mother, at Coryton, Essex. The layout of the refinery is outlined, with some construction details. The thermofor cat cracking plant, the first of its kind in Gt. Britain, manufacture of bead cat, and the continuous percolation unit, and operation, are described. G. A. C.

1758. Reconstruction and expansion of German refineries. Refinery of Gewerkschaft Erdöl-Raffinerie Emsland, Lingen-Holthausen. D. von Eynatten. *Erdöl u. Koble*, 1954, **7**, 433–6.—New plant for 500,000 tons/year of low-S Emsland crude. Combination of largest (1450 tons/day) German cat cracker (Houdriflow) with delayed coking plant. Oil heated to 360° C, overhead to cracking, bottoms to coking, coke chambers hydraulically cleaned after 24 hr, coking plant volatiles returned to crude vaporizer. Refining is Girbotol process for LPG (subsequently polymerized), NaOH for gasoline, furfural for diesel fuel. Yields (wt %): gasoline 48, diesel fuel 14, LPG 7, coke 11, gas (for fuel) 6, fuel oil 6; with 7% coke burnt off in cat regeneration and 1% loss. V. B.

1759. Flexibility in refining processes. G. L. Farrar. *Oil Gas J.*, 5.7.54, **53** (9), 130.—Process flexibility and considerations in revamping old units are becoming important to the refiner because operations are changing rapidly. In revamping old units a preliminary process study must be made, equipment and auxiliary facilities surveyed and construction costs estimated. Flexibility in process design depends on a reasonably variable crude type and sources, optimum number and choice of units and a suitable range of operating conditions. Reserve equipment, such as pumps, heat exchangers, compressors, and columns, should also allow for a certain amount of flexibility. G. A. C.

1760. Designing fired tubular reactors. Pt II. P. G. Murdoch and C. D. Holland. *Petrol. Refin.*, 1954, **53** (6), 163–6.—A discussion of the applications of the approx design method developed in Pt I (*cf* Abs. **1206**, 1954) to the design of reactors and the prediction of the behaviour of existing ones. Agreement with stepwise integration is good, and this approx method is shorter and numerically simpler than a complete stepwise calculation. R. D. S.

1761. Experience with amine units. R. A. Feagan, H. L. Lawler, and M. H. Rahmes. *Petrol. Refin.*, 1954, **33** (6), 167–8.—Several design and operating suggestions are given for the reduction of corrosion, amine losses, and operating upsets in H_2S removal units using aq monoethanolamine. The main suggestions are: the use of amine concn of *ca* 15%, the limiting of reactivator reboiler temp and pressure, and the provision of a small batch still to purify the amine. R. D. S.

1762. Longer service from heat exchangers. J. D. Munro. *Oil Gas J.*, 26.7.54, **53** (12), 226.—Exchangers should be properly designed for velocity and streamlined flow of clean water, and the water should be adequately screened and treated. Corrosion types, including erosion, galvanic, graphitization, impingement, dezincification, deposit stress, and general, are discussed, and corrosion prevention practices given, such as temp cooling velocity and pressure control, design and arrangement of exchangers, construction, assembly, and operation. Additional measures include water treatment, neoprene lining of tube sheets, flanges, etc., and cathodic protection. G. A. C.

1763. Air cooled industrial heat exchangers. S. Kopp and C. H. Homer. *Petrol. Refin.*, 1954, **33** (6), 151–4.—An account of the development and application of air cooled exchangers both as coolers and condensers. Initial cost is lower than for liq cooled exchangers, and maintenance is less. The fan h.p. required varies between 2 and 5 h.p. per million B.Th.U/hr, and the outside film coeff is between 2 and 4 when using finned tubes. R. D. S.

1764. The theory of high-speed oil diffusion pumps. L. Riddiford and R. F. Coe. *J. Sci. Instrum.*, 1954, **31** (2), 33–6.—The importance of vapour density in the jets of high-speed oil diffusion pumps is stressed. Theoretical aspects are outlined, and experimental work relating pressures, pump-component dimensions, and pumping-speeds is described. C. N. T.

1765. Maintaining compressors at peak efficiency. E. Y. Pacmer. *Oil Gas J.*, 17.5.54, **53** (2), 102.—A means is presented of using an engine indicator mechanism for maintaining peak compression cyl efficiency. 10 pressure–time diagrams are depicted and analysed. G. A. C.

1766. How to reduce down time on compressor engines. E. R. Wagner. *Oil Gas J.*, 19.7.54, **53** (11), 136.—Preventive maintenance on a 1600-h.p., 8-cyl gas-engine-driven compressor can keep it in good mechanical condition with 1% or less down time using 50 or fewer man-hours labour/month, including inspection, minor repairs, and overhauls. G. A. C.

1767. There's no water pollution here. A. D. McRae. *Oil Gas J.*, 12.7.54, **53** (10), 103.—Contaminants at Imperial Oil Ltd's Sarma refinery are removed at source wherever possible. Biological oxidn is used to remove residual phenolic materials and other reducing compounds. Spent caustic soda and sour condensates are neutralized by flue gases. Solid material is dewaxed, de-oiled, and burnt in a furnace designed for the purpose. G. A. C.

1768. How Monsanto controls air and water pollution. H. E. Morriss. *Oil Gas J.*, 28.6.54, **53** (8), 114.—The Monsanto Chemical Co's Texas City plant adjacent to city and port facilities burns all wastes from stryene manufacture and used cat as far as possible. Nearly $1,000,000 was invested in the waste-control programme, and its operation costs $25,000 per month. A "leak committee," controlled dilution of wastes, azeotropic dist to recover hydrocarbons from waste water, and steam stripping to remove acrylonitrile wastes are among measures employed in the programme. G. A. C.

1769. Automatic treating of cooling water. J. T. Russell. *Oil Gas J.*, 12.7.54, **53** (10), 109.—A fully automatic installation is described which requires only weekly tests for supervising treatment, and has reduced cost of chemicals from 50 to 75% below former treatment. Only 2 chemicals used, sulphur and a corrosion inhibitor. Sulphur is burnt in a specially designed burner; and the corrosion inhibitor serves also as an algæcide and a bactericide. G. A. C.

1770. Patents. U.S.P. 2,675,865 (24.3.50; 20.4.54). C. L. Betzer, assr to General Motors Corpn. Fluid fuel furnace and anti-puffing means therefor.

U.S.P. 2,675,867 (14.1.48; 20.4.54). J. T. Norman. Pot type oil burner. D. A. R.

ABSORPTION AND ADSORPTION

1771. Patent. U.S.P. 2,675,095 (28.11.51; 13.4.54). M. J. P. Bogart, assr to Lummus Co. Process of absorbing desirable hydrocarbons from a mixture of gases, including hydrogen, methane, ethane, and the like in a single absorption column. D. A. R.

SOLVENT EXTRACTION AND DEWAXING

1772. Patents. U.S.P. 2,674,564 (12.10.51; 6.4.54). D. A. Hermanson, assr to Socony-Vacuum Oil Co. Method of separating waxy and oily materials.

U.S.P. 2,674,563 (7.2.52; 6.4.54). H. C. Myers, assr to Socony-Vacuum Oil Co. Solvent dewaxing process. D. A. R.

CRACKING

1773. First commercial Hyperformer. C. Berg. *Oil Gas J.*, 2.8.54, **53** (13), 91.—The first commercial Hyperforming unit will commence operating this year at Signal Hill plant of Calstate Refining Co. Yield of 10-lb R.V.P. gasoline will be 104·4% by vol, with 9% outside butane. Research octane rating with 3 ml TEL per gal is expected to be 93·7. Net cost of plant operation is less than 12 cents/brl of product. G. A. C.

1774. What goes on inside a coke drum? C. E. Werstler, R. J. Niederstadt, and H. A. Lutz. *Oil Gas J.*, 9.8.54, **53** (14), 98.—Coke-level and phase relations in a delayed coking drum have been determined using γ-ray-emitting Cobalt 60 in the East St Louis refinery of Socony-Vacuum Oil Co. The equipment showed a vapour with a density of 9 lb/cu. ft. exists some 8–12 ft above the coke bed, with increasing density as the coke level continues to increase, reaching 45 lb/cu. ft. as the coke passes the determination level within a 30-minute period. G. A. C.

1775. Model II fluid hydroformer: shot-catalyst principle. C. W. Tyson, E. W. Nicholson, and E. J. Gornowski. *Oil Gas J.*, 17.5.54, **53** (2), 122.—Distinguishing feature of the Model II fluid hydroformer is that it has one more source of heat supply than the Model I process. The new heat source is an inert solid stream which circulates with the cat between the reactor and regenerator, and conveys into the reactor the heat of regeneration which cannot be economically transported by the cat itself. G. A. C.

1776. Hydrofining now numbers 19 units. Anon. *Petrol. Refin.*, 1954, **33** (6), 144.—Affiliates of Standard Oil Co (N.J.) plan to install 19 hydrofining units with a total capacity of 155,000 b.d. 5 of these, 3 in the U.S.A. and 2 in England, are already in operation with a total capacity of 28,000 b.d. The process utilizes hydrogen and a metal oxide cat to upgrade a range of products varying from gasolines to waxes. R. D. S.

1777. Performance checked, baffle loading improved. G. S. Houghlands, E. J. Lemieux, and W. C. Schreiner. *Oil Gas J.*, 26.7.54, **53** (12), 198.—Calculations were made on a number of cat cracking unit fractionating towers ranging from 13 to 20 ft dia to determine performance. Fractionation between overhead and first side-stream and between first and second side-stream could be predicted with ±15% by a modified packer correlation. Efficiencies of a tower, based on calculations by various methods varied from 45 to 51%, whilst a reduction of 8·25% because of entrainment was calculated.

Elimination of baffle overlap increased plant capacity and permitted increased throughput. G. A. C.

1778. Patents. U.S.P. 2,674,635 (10.5.50; 6.4.54). La V. H. Beckberger, assr to Sinclair Refining Co. Method of thermally converting higher mol. wt. hydrocarbon fractions rich in alkylated fused-ring aromatic compounds to lower mol. wt. hydrocarbons.

U.S.P. 2,676,909 (5.11.51; 27.4.54). C. F. Bethea, assr to Phillips Petroleum Co. A process for concomitantly cracking a heavy residuum and propane which comprises heating a gravitating compact column of refractory pebbles in an upper confined heating chamber by contact with hot combustion gas. D. A. R.

HYDROGENATION

1779. Patents. U.S.P. 2,674,634 (5.8.50; 6.4.54). B. S. Greensfelder and R. J. Moore, assrs to Shell Development Co. Hydrogenation of polyunsaturated compounds.

U.S.P. 2,675,390 (19.5.50; 13.4.54). E. F. Rosenblatt. Process for the hydrogenation of an unsaturated cyclic compound to the corresponding saturated cyclic compound. D. A. R.

POLYMERIZATION

1780. Polymerization of ethylene to lubricating oil. II. Investigations on the composition of the high-molecular fraction of the polymerization product by adsorption analysis. G. Geiseler, H. Herold, and F. Runge. *Erdöl u. Kohle*, 1954, **7**, 357–62 (*cf.* Abs. **1625**, 1954).—Preliminary adsorption on coarse grained silica-gel of asphaltenes (4%, mean mol. wt. 1617, $^{\circ}E_{50}$ 680, d_{20} 0·887) followed by adsorption analysis of resultant pale oil (96%, mean mol. wt. 776, $^{\circ}E_{50}$, 39, d_{20} 0·852) on specially prepared fine-grained gel. Technique developed by tests on oil, from low-temp hydrogenation, of known composition. Separated fractions, of decreasing mol. wt. with increasing elution (C_6H_6–CH_3OH eluant), analysed by *n–d–M* method. Oil has fairly uniform structure (% C_A 0–1, % C_N 9–21, R_N 1·4–3·9) over wide mol. wt. range (440–2090), urea-adduct tests did not show any *n*-paraffins. Results on oil extracted from $AlCl_3$ sludge very similar. V. B.

ALKYLATION

1781. Eastern States adds alkylation. Anon. *Petrol. Refin.*, 1954, **33** (6), 162.—The Eastern States Petroleum Co's 3000-b.d. aviation gasoline refining unit at Houston was put on stream in the record time of 101 working days. The new cascade type reactor is the largest ever put into service. Acid contacting takes place in a large horizontal reactor at 35° F and 3 p.s.i.g. The low temp is maintained by flashing propane and butane in the reactor and recycling through a refrigeration system. R. D. S.

1782. Patent. U.S.P. 2,674,637 (31.5.50; 6.4.54). R. S. Manne, assr to Standard Oil Development Co. Alkylation of an *iso*paraffin with an olefin by a 2-stage Friedel–Crafts cat process. D. A. R.

CHEMICAL AND PHYSICAL REFINING

1783. Information on reactions and reaction velocities in regeneration of washing liquors of the metalthionate process for hydrogen sulphide purification of coal gas. The manganese sulphate process. Pt III. E. Terres, H. Buschor, and G. Matroff. *Brennstchemie*, 1954, **35** (9–10), 144–51.—Pts I and II dealt with FeS and ZnS; the present investigation examines the effect of MnS in aq-SO_2 soln, in which presence of ammonium salts increases the soln rate. The method of conversion of sulphites into sulphates over thiosulphate and polythionate is applicable to the $MnSO_3$–$MnSO_4$-process. Formation of Mn and NH_3 double salts presents no tech difficulty. Results of the experiments described suggest a method for converting NH_3 and H_2S of coal gas directly and continuously into $(NH_4)_2SO_4$ and S, by washing the gas with a regenerated washing liq, through treatment with $MnS + SO_2$ at 40°–60° C. Suitable structural materials for the plant are essential. The article is amply illustrated with charts and tables. R. T.

1784. Reduce clay dosages by 50%. E. B. Field. *Petrol. Refin.*, 1954, **33** (6), 149–50.—The adsorbent required for decolorizing a residual oil can be reduced considerably by dist the oil in high vacuum into light and dark fractions, clay contacting the fractions separately, and then reblending. The saving in clay results from the more effective removal of colour bodies from dark than from light products. R. D. S.

1785. How to predict true volumes in blending. E. J. Reeves. *Petrol. Refin.*, 1954, **33** (6), 137–9.—A brief summary of previous methods of prediction is given, and 2 empirical equations are presented for the approx estimation of the vol changes encountered in blending petroleum fractions at temp of 60°–70° F. The difference between calculated and observed contractions is *ca* 20%. R. D. S.

1786. Hydrocarbon purifier reduces aviation-gasoline corrosiveness. F. L. Reson. *Oil Gas J.*, 28.6.54, **53** (8), 120.—Southwestern Oil Refining Co has installed at its Corpus Christi, Texas, plant, a hydrocarbon purifier which passes hot aviation gasoline through a reactant aggregate to neutralize corrosive contaminants in the stream. Process is suitable for light products generally. G. A. C.

1787. Patents. U.S.P. 2,674,562 (5.5.49; 6.4.54). O. M. Elliott, assr to Sun Oil Co. Method for removing water from a light coloured normally liq mineral oil dist boiling not substantially above kerosine and containing not substantially more than 1000 p.p.m. of water.

U.S.P. 2,674,563 (4.1.50; 6.4.54). R. A. Findlay, assr to Phillips Petroleum Co. Process for effecting liq–liq solvent extraction with relatively viscous solvents.

U.S.P. 2,674,566 (22.11.52; 6.4.54). J. C. D. Oosterhout and G. D. Pingrey, assrs to Texas Co. Treating hydrocarbon oils containing mercaptan sulphur to effect the sweetening thereof by contacting the oil with an organic metal salt and a mercapto-alkyl-benzimidazole.

U.S.P. 2,674,567 (7.6.51; 6.4.54). J. L. Meadows, assr to Texas Co. Process of dethiolizing hydrocarbons by contacting the hydrocarbons with a soln of alkali metal hydroxide in diethylene glycol monomethyl ether containing a relatively small proportion of an aminophenol or nitrophenol effective to inhibit impairment in colour of the hydrocarbon.

U.S.P. 2,674,578 (Sweden 26.9.50; 6.4.54). J. H. O. Lindhe, assr to A. Johnson and Co. Process for preventing cloudiness in refined lub oils.

U.S.P. 2,675,126 (15.6.50; 13.4.54). E. R. Williams. Apparatus for separating oil from water.

U.S.P. 2,675,344 (9.8.50; 13.4.54). P. B Weisz and A. N. Sachanen, assrs to Socony-Vacuum Oil Co. A method for removing colour bodies from a petroleum lub oil containing the same, which consists of contacting the oil in the liq state with a solid water-insoluble inorganic metal sulphide at a temp between *ca* 20° and *ca* 200° C and separating the oil so treated from the sulphide.

U.S.P. 2,675,883 (25.5.50; 20.4.54). R. M. Deanesly, assr to Universal Oil Products Co. Recovery of liq from gas–oil mixtures.

U.S.P. 2,676,141 (30.6.50; 20.4.54). V. H. Kane and G. R. Bellville, Jr, assrs to Texas Co. A process for separating complex-forming hydrocarbons which are predominantly normally aliphatic in nature from a hydrocarbon mixture by contact with urea.

U.S.P. 2,676,999 (Germany 1.10.48; 27.4.54). H. Schwenke, assr to Koppers Co. Process for removing resin-forming constituents from raw benzene or a benzene, toluene, or xylene fraction thereof.

U.S.P. 2,676,995 (19.6.51; 27.4.54). J. Stewart and T. H. Hakala, assrs to Standard Oil Development Co. A process for the isolation of a water-immiscible straight-chain primary alcohol from other water-immiscible organic compounds.

U.S.P. 2,676,912 (22.10.52; 27.4.54). D. S. Maisel, assr to Standard Oil Development Co. Process of purifying phenol contained in a feed mixture with sludge materials comprising C_5–C_7 olefin and diolefin reaction products by fractional dist is improved by adding into a fractionation zone where vapours of the phenol are being distilled from the sludge materials a hydrocarbon oil less volatile than the phenol, recovering the fractionated phenol as a dist freed of sludge, and recovering the sludge mixed with the hydrocarbon oil as a bottoms product of the zone.

U.S.P. 2,676,910 (26.5.51; 27.4.54). M. H. Edson, assr to Standard Oil Development Co. A process for treating residual oils comprising adding *ca* 0·1–5% by wt of P_2O_5 to the residual oil and agitating the mixture in the absence of free oxygen at a temp of *ca* 300°–550° F. D. A. R.

SPECIAL PROCESSES

1788. Down time 7 days in year's operation. J. A. Tiehen. *Oil Gas J.*, 19.7.54, **53** (11), 86.—The field collection system and plant operation at the Delaware sulphur recovery unit of the Seaboard Oil Co is described. A modified Claus process recovers 45 tons of sulphur daily from gas. During the initial year of operation the Silvertip plant has been off stream for a total of less than 7 days. G. A. C.

1789. New plant will combine three processes. J. C. Reidel. *Oil Gas J.*, 2.8.54, **53** (13), 78.—The new ammonia and urea plant at Pryor, Oklahoma, built by Deere and Co, is described. Daily capacity will be 180 tons of ammonia and 260 tons of urea. 3 processes will be employed: (1) partial oxidn of natural gas with oxygen; (2) Casale process for ammonia synthesis; and (3) Pechiney process for urea production. Automatic control devices will be extensively used. G. A. C.

1790. Flexibility—a must in petrochemicals to-day. G. L. Farrar. *Oil Gas J.*, 17.3.54, **53** (2), 94.—This article, based on papers given at a recent annual national meeting of the American Chemical Society in Kansas City, discusses methods of achieving flexibility by reserves in design, in product distribution, and in raw-material supply. Tables show product distribution from mild and severe cracking of crude oil, and overall economic summary of severe cracking 10,000 b.s.d. paraffin crude oil. G. A. C.

1791. Patents. U.S.P. 2,674,363 (16.11.50; 6.4.54). O. W. Graham, assr to Instruments Inc. Method of controlling the condition of a cat bed in a cat process of the moving-bed type.

U.S.P. 2,674,496 (18.10.50; 6.4.54). C. H. Thayer, assr to Sun Oil Co. Multiple conduit system for elevating contact material.

U.S.P. 2,674,498 (29.12.50; 6.4.54). C. H. Thayer, assr to Sun Oil Co. Apparatus for elevating granular solids by means of a lifting gas and for disengaging gas from solids after such elevation.

U.S.P. 2,674,499 (16.4.51; 6.4.54). C. H. Thayer, assr to Sun Oil Co. Apparatus for elevating granular solids by means of a lifting gas through a lift conduit and into a disengaging vessel, providing therein a vertically elongated space directly above the top of the lift conduit, and providing, surrounding and in communication with the space, a vertically elongated expansion space for expansion of lifting gas.

U.S.P. 2,674,522 (21.6.46; 6.4.54). R. B. Takewell and F. W. Selfridge, assrs to J. M. Huber Corpn. Apparatus for pelletizing dry carbon black.

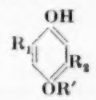
U.S.P. 2,674,524 (21.7.51; 6.4.54). P. W. Garbo, assr to Hydrocarbon Research Inc. A process for the production of carbon monoxide and hydrogen from a solid carbonaceous fuel containing volatilizable hydrocarbonaceous constituents.

U.S.P. 2,674,582 (1.7.49; 6.4.54). J. R. Darby, assr to Monsanto Chemical Co. A cat for the vapour phase oxidn of benzene to maleic anhydride which comprises a porous, inert mass of finely subdivided silica, impregnated with a cat active material containing vanadium.

U.S.P. 2,674,611 (1.2.49; 6.4.54). C. E. Hemminger, assr to Standard Oil Development Co. Hydrocarbon synthesis process.

U.S.P. 2,676,142 (4.6.49; 20.4.54). J. A. Crowley, Jr, assr to Socony-Vacuum Oil Co. Hydrocarbon conversion and contact material transfer method.

U.S.P. 2,676,191 (25.11.49; 20.4.54). J. R. Hoatson and R. H. Rosenwald, assrs to Universal Oil Products Co. A process for the selective de-alkylation of a phenolic compound having the empirical formula :



in which R_1 and R_2 are *tert*-alkyl groups containing not more than 8 carbon atoms per group and R′ is an alkyl group to form thereby a 3-*tert*-alkylphenol which comprises heating the phenolic compound in the presence of an acid-acting de-alkylation cat to a temp of from *ca* 100° to *ca* 300° C.

U.S.P. 2,676,193 (31.1.51; 20.4.54). W. W. Johnstone, assr to Universal Oil Products Co. Preparation of alkyl phenols from gasoline.

U.S.P. 2,677,000 (27.2.51; 27.4.54). L. W. Russum, assr to Standard Oil Co. Hydrocarbon conversion with aluminium chloride–hydrocarbon complex cat.

U.S.P. 2,676,907 (17.12.49; 27.4.54). A. G. Oblad, T. H. Milliken, Jr, and H. Heinemann, assrs to Houdry Process Corpn. Cat conversion of hydrocarbons in the presence of hydrogen. D. A. R.

METERING AND CONTROL

1792. Wanted : an effective pulsation dampener. E. J. Lindahl. *Oil Gas J.*, 17.5.54, **53** (2), 108.—An analysis is given of the basic nature of pulsation (which renders flow measuring devices inaccurate), some of the devices now being used to minimize pulsation are described, and an evaluation is made of recent studies and possible future research on this measurement problem. G. A. C.

PRODUCTS

CHEMISTRY AND PHYSICS

1793. Applied chemical kinetics. J. C. Jungers and J. C. Balaceanu. *Rev. Inst. franç. Pétrole*, 1954, **9**, 262–95.—9th instalment dealing with gas phase thermal reactions; simple (bimolecular, monomolecular) and complex (isomerization of H_2, synthesis of HBr). (*Cf.* Abs. **1645**, 1954.) V. B.

1794. Physical properties of absorbents and catalysts. F. Heinemann and H. Heinemann. *Petrol. Refin.*, 1954, **33** (6), 159–61.—A summary of the relevant physical properties, pressure drop, and drying data for a number of the most common adsorbents and cat. R. D. S.

1795. Absorption spectroscopy of explosions. P. L. Hanst and A. L. Myerson. *Rev. Sci. Instrum.*, 1954, **25**, 469.—In this apparatus the progress of spontaneously-induced explosions can be studied. In the explosion of CS_2 and O_2 the reacting gases emit radiation which falls on a photocell, and the electrical signal triggers a flash bulb. The light passes through the exploding gases on to a recording spectrograph. The relative intensities of light from flash bulb and explosion are such that the latter does not affect the photographic plate.

The time at which the record is made after the start of the reaction can be controlled by placing a filter of appropriate thickness in front of the photocell, and can be varied from 4 millisec to the entire extent of the reaction. H. C. E.

1796. The ingredients of petroleum and other bituminous oils. F. Challenger. *Times Rev. Ind.*, 1954, **8** (91), 26–8.—Survey of investigations on mineral oil composition, under following heads : hydrocarbons, bases, acids, ketones, phenols, sulphur compounds. Last are treated in greater detail (aliphatic sulphides, cyclic sulphides, thiophen derivatives, polycyclic thiophen derivatives). Numerous structural formulæ of isolated materials are given. Technical applications of pure S compounds obtained from petroleum are indicated. V. B.

1797. Friction in relation to rheological properties. D. Tabor. *Nature, Lond.*, 1954, **173**, 899.—Account of a symposium convened by the British Society of Rheology. Deals mainly with the adhesion forces between metals in contact, and the extent to which these forces are modified by the presence of oxide films.

Under the conditions of boundary lubrication the lubricant film, which is sheared during sliding, is subjected to pressures comparable to the yield pressure of the metal (for steel *ca* 200,000 p.s.i.). Under these conditions the resistance of the film to shear and penetration is enormously increased. H. C. E.

1798. Comparison of the solubilization of several paraffin hydrocarbons by a polysoap. L. H. Layton and U. P. Strauss. *J. Colloid Sci.*, 1954, **9**, 149–56.—The solubilization of several paraffin hydrocarbons by a polysoap prepared by the partial quaternization of poly-2-vinyl pyridine with *n*-dodecyl

bromide was studied viscosimetrically in order to determine the influence of chain length and branching of the hydrocarbons. *iso*-Octane was solubilized to practically the same extent as *n*-octane, indicating that chain branching is of minor consequence. However, the solubility of the hydrocarbons decreased with increasing number of C atoms, although not as rapidly as with ordinary soaps. The solubility of hexadecane was still 40% that of hexane.

While a temp increase speeded up the solubilization process, it did not affect the hydrocarbon solubility, and it caused only a very minor decrease in the reduced visc of the polysoap soln, both in the presence and absence of solubilized hydrocarbon. H. C. E.

1799. International flame radiation research committee—new laboratory. O. A. Saunders. *Nature, Lond.*, 1954, **173**, 1160–2.—Description of new furnaces and associated equipment for studying the radiation and combustion properties of furnace flames.

There are 2 furnaces installed, one for oil and gas fuels and the other for pulverized coal, of similar construction. Dimensions are $2 \times 2 \times 6{\cdot}3$ m long and $1{\cdot}5 \times 1{\cdot}5 \times 10$ m long, respectively. All types of fuel can be burned, from propane on the one hand to lignite on the other. Measurements of electrical output from radiation and suction pyrometers, thermocouples, etc., are recorded electronically. Gas analysis apparatus is provided. Black body radiation furnaces for the calibration of pyrometers are installed, and a model water-cooled furnace is also available.

Work will be carried out with 2 aims: (*a*) to provide a basis for improvement in industrial furnace design; (*b*) to provide a basis for a theory of flame combustion and radiation. H. C. E.

ANALYSIS AND TESTING

1800. Paraffin-wax standardization. G. Titschack. *Erdöl u. Kohle*, 1954, **7**, 444–50.—Following German draft standards are reproduced and commented upon: DIN 51570, setting pt, based on IP 55/44 (an alternative is DIN 51556, based on IP 76/44); ASTM D 127–30 was not favoured, as it can give too high results for certain mixtures. DIN 51571, oil content, based on ASTM D 721–47; ASTM D 741–52 T was not adopted owing to the specialized microtechnique required, subsequent standardization of a suitable micro-method, after discussion with ASTM, is not excluded. DIN 51572, soft wax content; wax dissolved in MEK containing 1·2% H_2O, filtered at 12° C and soft wax in filtrate weighed after evap solvent. DIN 51573, neutrality and test for Cl' and SO_4''; neutrality by extraction with hot EtOH and testing with phenolphthalein, ionic constituents by extraction with hot H_2O and testing with $AgNO_3$ and $BaCl_2$; this test will be adopted by DAB VII. V. B.

1801. Problem of the " master " viscometer. H. Umstätter. *Erdöl u. Kohle*, 1954, **7**, 436–8.—Description and drawing of " free-flow " viscometer, having 40-cm capillary surmounted by 3 bulbs, 1, 2, 5 ml (giving 6 ranges), and which can also be used as suspended-level instrument. From 101 determinations (250 sec flow-time), by 2 operators on several tubes, repeatability found to be 0·11% and reproducibility 0·30%. V. B.

1802. Three-level capillary viscometer. For study of non-Newtonian flow in sealed systems. J. G. Honig and C. R. Singleterry. *Analyt. Chem.*, 1954, **26**, 677–80.—A problem involving the rheological behaviour of oil-soluble soap in a volatile hydrocarbon has promoted the design of a viscometer which would exclude moisture and oxygen over extended time intervals, allow repeated measurements on a given soln, yield reproducible results over a 250-fold visc range, and characterize quantitatively deviations from Newtonian flow. The absolute dimensions of the instrument have been determined from X-ray photographs and direct measurements, permitting specification of shearing stress and rate in absolute units. The rheological properties of non-Newtonian systems can usually be specified by a pair of constants, one describing the consistency level of the systems under specified shearing conditions and the other characterizing the deviation from Newtonian flow. The method for obtaining these constants from an equation fitting the flow data is illustrated for typical data. Such constants present data for non-Newtonian flow in a more compact and comparable form than do the graphs usually employed. J. S.

1803. Spectrochemical determination of copper in turbine oils. J. E. Barney. *Analyt. Chem.*, 1954, **26**, 567–8.—Studies of the influence of copper on the oxidn of turbine oils require the determination of microgram amounts of that element in the oil. Copper in very low concn can be detected by the spectrograph, and a spectrochemical procedure has been developed using only a few tenths of a ml of sample. J. S.

1804. Determination of hydrocarbon gases as air contaminants. E. R. Quiram, S. J. Metro, and J. B. Lewis. *Analyt. Chem.*, 1954, **26**, 352–4.—Small concn of hydrocarbon gases in the air may be determined by concn by adsorption on silica gel at −100° F, followed by desorption into an evacuated gas sampling container and the desorbed gases are analysed by means of a mass spectrometer. Results show that approx 95% to C_3, C_4, and C_5 hydrocarbons was obtained while on a C_3 hydrocarbon 60% recovery was found. The method is not intended for the quantitative estimation of non-hydrocarbon compounds, such as sulphur, chlorine, or nitrogen, or the oxides of carbon. J. S.

1805. Equilibrium K's by nomograph. F. W. Winn. *Petrol. Refin.*, 1954, **33** (6), 131–5.—A correlation of the vapour–liq equilibria K ratios of the light hydrocarbons, narrow cut petroleum fractions, and certain non-hydrocarbons is presented as a function of the temp and pressure of the system and the composition of the liq phase. It is applicable from 40° to 800° F at pressures up to 10,000 p.s.i.a. The average deviation from experimental data is 6·8%. R. D. S.

1806. Analysis of gas oil, and cycle stocks from catalytic cracking. E. M. Charlet, K. P. Lanneau, and F. B. Johnson. *Analyt. Chem.*, 1954, **26**, 861–71.—A chromatographic technique is described for a type separation of the polynuclear aromatic hydrocarbons found in heavy gas oils and cycle oils. Use of a sectional adsorption column is discussed, as well as the use of U.V. absorption spectra for identification of the polynuclear aromatic types found in the chromatographic fractions. A method utilizing infra-red absorption data, mol. wt., and carbon–hydrogen determinations in conjunction with the chromatographic separations and U.V. absorption spectra is applied in the quantitative analysis of the aromatic fractions from a heavy gas oil and heavy cat cycle oil. J. S.

1807. Determination of various hydrocarbon groups by a fluorescent indicator adsorption method. A. Crozier. *Rev. Inst. franç. Pétrole*, 1954, **9**, 397–402.—Study of method described by Criddle and Letourneau (*cf.* Abs. **1913**, 1952). Analyses of 3 gasolines (S.R., reformed, cat cracked) and artificial mixture (30% toluene, 30% *iso*-octene, 40% *iso*-octane). Comparison with results obtained by I.R. spectrography, sulphonation (ASTM D 875–46T), and Br. No. (ASTM D 1158–52T). Overall accuracy of adsorption method ±1%; purity of silica gel essential. Presence of conjugated olefins and *cyclo*-olefins complicates distinction between aromatics and olefins. Method generally convenient, requires <1 ml, and one operator can run 6 tests. V. B.

1808. New reagent for the determination of thiophene. J. Giral and E. Jalmes. *Ciencia, Méx*, 1953, **13** (4–6), 75–6; *Chim. anal.*, 1954, **36**, 195 (41D).—Soln of ¼% SeO_2 in conc H_2SO_4; 1 ml added to 10 ml of C_6H_6 (also gasoline, kerosine). Shake and heat on water bath to evaporate hydrocarbon

layer. Cool, stand 15 minutes, blue colour indicates thiophene; sensitivity *ca* 3 p.p.m. Quant estimation with use of photo-colorimeter and 6400–7000 Å filter. V. B.

1809. Review of modern methods of chemical analysis. G. Chatelus. *Rev. Inst. franç. Pétrole*, 1954, **9**, 308–20; 403–411.—Bibliographical survey, first portion devoted to general, inorganic, and organic aspects, which could be applicable to petroleum; whilst second portion deals with analysis of petroleum products for elements and inorganic compounds, and also for organic constituents. 479 refs. V. B.

1810. German standards. Sampling. Anon. *Erdöl u. Kohle*, 1954, **7**, 378–9.—Draft of DIN 51594, covering sampling of greases, petroleum jellies, fats, waxes, etc. Procedure for sampling bulk and packages, levels at which samples to be taken, make-up of average samples. Recommended sampling devices illustrated. V. B.

1811. Lubricant testing. A. von Hoyningen-Huene. *Erdöl u. Kohle*, 1954, **7**, 393–7.—Lab testing discussed, with reference to appropriate DIN methods. Table given approx relating V.I. and visc pole ht (V.I. 0 = V_p 3·53, V.I. 150 = V_p 1·00), Turbine oil change recommended at neut. val. 3 and sap. val. 6. Noack evap test (1 hr, vac 20 mm H_3O, 250° C) described; for motor oils value is 5–15%. V. B.

1812. Behaviour of bituminous materials in ultra-violet light. H. Schmidt. *Erdöl u. Kohle*, 1954, **7**, 428–33.—0·05 ml of a 1% soln of test material is introduced through upper of two 5-mm-dia, 5-cm-long tubes, between which sheet (6 × 6 cm) of special filter paper is pressed. Stain formed has dia (15–40 mm) varying with volatility of solvent and MW of solute. Preferred solvent is 170°–175° C cut ("decane"). Solvent removed in oven and stain examined by filtered U.V. light. Stain quickly fades in U.V. or daylight, but can be preserved in vac in dark. Types of U.V. picture given by various materials discussed in detail, differentiation possible between blown, cracked, residual bitumens. Further distinction achievable by using another solvent, *e.g. cyclo*hexane or (particularly for coal-tar materials) methylene chloride. Diagrams show typical results obtained with petroleum, bitumen, natural asphalt, coal-tar products, using decane and *cyclo*hexane. V. B.

GAS

1813. Operation and maintenance made easy. J. E. Owens. *Oil Gas J.*, 19.7.54, **53** (11), 105.—The compactly built natural gasoline plant of the Sohio Petroleum Co in the Eola field, Oklahoma, produces only natural gasoline and a 90–125 p.s.i. L.P.G. Capacity is 25,000–30,000 gal/day of liq hydrocarbons. Process heating is by direct-fired heaters, stripping steam is produced in fin-tube exchanger. Meters and meter runs are in one location, instruments in a central control house, and the plant can be shut down remotely from 2 locations. G. A. C.

1814. Vortex burner—useful tool for studying the flame stability of gaseous fuels. P. F. Kurz. *Rev. Sci. Instrum.*, 1954, **25**, 418–21.—Air is delivered via a distributing chamber through tangential holes into a vortex-generating chamber, and thence through a converging nozzle into a cyl throat. Here the fuel is injected through 4 radial ports into the air stream, and the flame is produced in an inverted truncated cone. The flame burns in the form of a whirling inverted cone, held in space, with its vortex within the confines of the truncated cone.

The stability of the flame is established by fixing the rate of fuel supply and increasing the air stream until the "blow-off" point is reached. Good reproducibility is obtained.

It is found that flame stability is independent of the tangential air velocity over a limited range, and is unaffected by orifice sizes. Stability is affected by throat dia, and less fuel is required with a throat ½-inch dia than one with a diameter of ¼ inch. Leaner flames can be established if the length of the truncated cone is increased. H. C. E.

ENGINE FUELS

1815. Combustion and performance in diesel engines. Pt IV. G. B. Fox. *Gas Oil Pwr*, 1954, **49**, 114–16.—Previous articles in this series discussed volumetric efficiency, fuel injection, starting troubles, etc., from the standpoint of the engine. This paper describes the effect of fuel characteristics on engine performance, under the headings: C residue, sulphur, centrifuging, ignition quality, and visc. The suitability of fuel of various specifications for different engines is briefly discussed.

The calorific values of different fuels are almost the same; difficulties arising from the use of a low grade fuel begin through the formation of deposits on the cyl head, injector tip, valve and piston rings, and hence the Conradson C value of the fuel is of significance. For use in small high-speed diesel engines the Conradson value must be 0·1 max; medium-sized engines can tolerate fuel of high C value because the deposits initially formed break away and blow through the exhaust. They can also be removed by running at full load.

Difficulties in the use of fuel of high S content may be associated with the type of carbon formation, *e.g.* abrasiveness, but if fuel of high S content is used the jacket temp must be >140° F.

Centrifuging is of little importance for runs of short duration, but the removal of traces of abrasive matter from the fuel is certainly beneficial in the long run.

Ignition quality of the fuel affects the rate of pressure rise in the cyl. Fuels of low ignition quality can be improved by: (*a*) addition of gas oil; (*b*) improved atomization in the cyl.

Large engines in particular can run smoothly on fuel of high visc, provided that the fuel is heated to *ca* 175° F before injection. H. C. E.

1816. Running gas turbines on methane. Anon. *Gas Oil Pwr*, 1954, **49**, 145.—This Ruston TA set develops 1260 b.h.p. and is intended for use in the Kuwait oilfield. Washed sludge gas (90% methane) from a sewage works was used as fuel at 140 p.s.i., and a brief description of 3 tests with this fuel is given. H. C. E.

1817. Operation of diesel engines with heavy oil. I. Heavy oil as fuel—economics of heavy oil operation—heavy oil operation in large cross-head diesel engines. G. Zimmermann. *Erdöl u. Kohle*, 1954, **7**, 366–71.—Fuel oil specs and cost compared. MAN operated ships' diesel on heavy oil in 1922. When using heavy oil in 2-stroke engines special attention to scavenging is required. Effect of high S and asphaltene content of fuels is considered, main counter-measure to wear is high (⩾60° C) coolant exit temp with 10°–15° C max coolant temp rise. From results of runs on test engine (double-acting 2-stroke) the following fuel spec for large MAN cross-head engines is evolved (max values): d_{20} 0·95, visc/100° F 170 cs, open flash 200° C (with 65° C min), H_2O 1%, S 3%, ash 0·03%, asphaltenes 3%, Zn corrosion test 4 mg, C residue (Con) 10%, Cetane No. (min) 30; of these tests first three recommended for verification when bunkering.

II. Heavy oil operation in medium capacity trunk-piston engines—motor oil problems—further developments of heavy oil operated engines. *ibid.*, 438–41. Medium capacity (bore >300 mm) trunk-piston engines are more difficult to operate on heavy oil, but this is possible if precautions are taken, *e.g.* use of special exhaust valve seats ("Perzit," 1·2% C, 20% W, 30% Cr, 47% Co), with Cr–Si steel exhaust valves. Exhaust turbines are not damaged by use of heavy fuel. For test runs on diesel fuel, a naphthenic lub oil (visc/50° C 77 cs, V.I. 1) is used but with heavy oil a mildly HD naphthenic base oil (SAE 30) is required, preliminary tests indicate SAE 20 may be satisfactory. Trunk-piston engines on heavy oil require high-additive lub, with oil purification (centrifuge and/or filter) during engine operation. Trend of future heavy oil utilization developments is to highly-loaded 4-stroke and exhaust-turbine coupled large 2-stroke cross-head engines. V. B.

1818. Fuels for compression-ignition engines. R. Vichnievsky. *Rev. Inst. franç. Pétrole*, 1954, **9**, 376–96.—Review. Operation of CI engines is described, effect of fuel properties is considered, with particular reference to ignition quality and methods for its determination or calc, and to wear (influence of S, ash, C residue). French, U.S.A., U.K. specifications for high-speed (>1000 r.p.m.) CI engines are given and discussed. Numerous graphs (from literature) of CI engine fuel properties. Tabulation of these and their effect on engine performance. 28 refs. V. B.

1819. Patents. U.S.P. 2,675,305 (1.11.51; 13.4.54). D. T. Rogers and R. V. High, assrs to Standard Oil Development Co. Process for the production of a high quality motor fuel and a high quality heating oil.

U.S.P. 2,676,908 (1.12.48; 27.4.54). H. M. Noel, assr to Standard Oil Development Co. Carbonization of lignite to produce motor fuels. D. A. R.

GAS OIL AND FUEL OIL

1820. Methods for the utilization of petroleum products used by the French gas industry. R. Delsol. *Bull. Assoc. franç. Tech. Pétrole*, 1954, 261–86.—1953 figures were: natural gas 80×10^6 m³, C_3H_8 8000 tons, estimated to increase to 30,000 tons when existing enrichment plants completed; gas oil 6000, waxy dist 58,000, heavy fuel 21,000, estimated to increase to 100,000 within 2 years. Residual gases from cat crackers also being employed to increasing extent. Gaseous products utilized either direct or else after cat, thermal, or authothermic reforming. Liq products after thermal, cat, or authothermic cracking. Flow outlines, product analyses, and yields of processes are given; also map showing location of propane-fed gas installations. V. B.

1821. Gas turbine operation on boiler oils. Anon. *Gas Oil Pwr*, 1954, **49**, 141–4.—It is deduced that a gas turbine of 25% overall efficiency produces power as cheaply as a diesel engine of 35% efficiency when both operate on boiler oil; the reason being that the gas turbine has negligible maintenance costs.

The chief difficulty in the use of boiler oil is that of turbine fouling and corrosion. From a table of m.p. of inorganic salts it is deduced that fouling may occur at any operating temp, and furthermore, some of the deposits may be sticky and so lead to excessive fouling. Corrosion can be overcome by using an operating temp of 600°–650° C, but then the plant becomes very complicated.

Deposition can be stopped by (*a*) use of a fuel additive; (*b*) use of multi-stage turbines to reduce the centrifugal forces on the ash particles. As an additive, ethyl silicate is satisfactory, but its use is not economic. Kieselguhr has also been tried, and also a suspension of silica in the fuel. H. C. E.

1822. Better burning, less corrosion, from residual fuel oil. E. C. Huge. *Oil Gas J.*, 19.7.54, **53** (11), 90.—Fuel-oil additives may be used to facilitate removal of ash deposited on the high-temp convection surfaces of boilers and to reduce low-temp air-heater corrosion. The additives may be introduced either as an oil slurry through atomizers or as an airborne material in dry form. Suitable additives are dolomite, oil-soluble calcium and magnesium compounds, and water-soluble aluminium salts. The use of additives means additional ash, and revision in ash-removing schedules may be necessary. G. A. C.

LUBRICANTS

1823. The choice of lubricants: synthetic or petroleum. W. Davey. *Petroleum, Lond.*, Apr. 1954, **17** (4), 122.—The need for lubricants of greatly improved performance has been created by engineering developments, and by the failure of conventional mineral oils to effect lubrication under very extreme conditions, but where mineral oils provide satisfactory lubrication, synthetics are not employed. Various synthetic oils, their advantages and limitations, are discussed. G. H. G.

1824. Hydrodynamic lubrication of roller bearings. W. Lewicki. *Engineer, Lond.*, 1954, **197**, 920–2.—Mathematical analysis of conditions affecting lubricant film thickness in roller bearings under different loads and speeds. Previous theories of roller bearing lubrication postulate that no continuous fluid film can exist between rolling elements, but these theories neglect elastic deformation. Now shown that lubricant film virtually cannot be pierced through overloading or overspeeding. Smaller dia of roller allows easier complete fluid separation, hence needle bearings often more satisfactory than other types. A. C.

1825. Determination of furfural in oil in refining operations by ultraviolet spectrophotometry. L. L. Gent, R. C. Pomatti, and H. Levin. *Analyt. Chem.*, 1954, **26**, 413–14.—Furfural is extensively used as a solvent in extraction refining of high grade lub oils. The paper describes a method for the determination of low concn of furfural in various petroleum fractions obtained in petroleum refining. The furfural is extracted from the oil samples with aq sodium bisulphite soln, the visc of the sample being reduced with *iso*-octane. The furfural is regenerated from the aq layer by the addition of potassium hydroxide, and the absorption is measured at 277 μ directly. The furfural concn may be read off from a previously prepared calibration curve. It was found that one extraction was usually sufficient as the absorbence of a second extraction was not significantly different from the absorbence of the blank reagent. J. S.

1826. Silicones—new tools for petroleum operations. F. L. Resen. *Oil Gas J.*, 2.8.54, **53** (13), 87.—A dimethyl silicone fluid is used in the Burnett apparatus for determination of deviations of natural gas from Boyle's law in order to make exact measurement of vol of natural gas through pipelines. Use of silicone greases in injection valves of gas compressors has greatly reduced lubrication frequency; another variety is used in electrical equipment, while silicone based paints are useful for coating mufflers. G. A. C.

1827. Patents. U.S.P. 2,674,568 (26.7.50; 6.4.54). J. G. Lillard, assr to Standard Oil Development Co. High V.I. lub oil.

U.S.P. 2,674,577 (7.5.52; 6.4.54). F. C. McCoy, B. L. Benge, E. C. Knowles, and C. C. Towne, assrs to Texas Co. Airplane engine oil containing combination of magnesium and zinc salts of alkyl hydroxy aromatic compounds.

U.S.P. 2,676,148 (23.10.50; 20.4.54). R. K. Iler, assr to E. I. du Pont de Nemours and Co. Lub composition containing surface-esterified siliceous solid.

U.S.P. 2,676,149 (29.12.51; 20.4.54). H. A. Woods and J. A. Edgar, assrs to Shell Development Co. Stabilized grease composition containing a sterol and a selenium compound.

U.S.P. 2,676,925 (30.12.50; 27.4.54). E. G. Lindstrom and R. L. Woodruff, assrs to California Research Corpn. Method of dispersing metal oxides and hydroxides in lub oils. D. A. R.

BITUMEN, ASPHALT, AND TAR

1828. Bituminous materials, their processing and use mirrored in recent German patent literature (Complement). H. Hoffmann. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (5), 143.—Continuation of classified groups of latest patent specifications for bituminous materials. Full descriptions. R. T.

1829. Patent. U.S.P. 2,676,155 (27.9.51; 20.4.54). R. W. Farris, assr to Owens–Corning Fiberglas Corpn. A composition for use in the impregnation of a fabric of glass wool

fibres to achieve rapid and substantially complete penetration thereof, consisting essentially of an asphalt-in-water emulsion and 0·005–2·0% by wt of a synergistic combination of sodium pentalauryl polypyrophosphate and sodium diethylhexyl sulphophthalate. D. A. R.

SPECIAL HYDROCARBON PRODUCTS

1830. Metal-working oils. H. L. Steinbach. *Erdöl u. Kohle*, 1954, **7**, 465–8.—Metal-forming operations and conditions arising therefrom discussed and brief description given of oil-based cutting fluids, both non-emulsified and emulsified. V. B.

1831. Use and abuse of liquid paraffin. K. Black. *Practitioner*, 1953, **171**, 675–7.—Liq paraffin is useful safe aperient for occasional use by adults, particularly in pathological rectal and anal conditions. Harmful effects are absorption of vitamins, A, D, K, and particularly of carotene, and risk of lipoid pneumonia, for latter reason oil-based nasal sprays are contra-indicated, especially for children. Sterilized liq paraffin is suitable lubricant for surgical instruments. V. B.

1832. Spectroscopic study of the photochemical stability of liquid paraffins. R. Schnurmann. *J. Phys. Radium*, 1954, **15**, 503–7.—Liq paraffins classified as stable by criteria previously proposed (*cf.* Abs. **1959**, 1951) show no change in U.V. spectrum when exposed in glass to U.V. illumination for long periods (weeks), but similar exposure in quartz vessels causes increase of absorption in the 2400–2800 Å range, with disappearance of band structure. Quant relationship was observed between such increase of absorption and initial absorption at 2710 Å. Indications are that "group A" (aromatic) compounds in liq paraffin absorb U.V. radiation and transmit energy to "group B" compounds, this view being supported by greater reaction rate in low visc oil. Using values of $E^{1\%}_{1\,cm}$ of 15 (at 2710 Å) for "A" and of 52 (at 2490 Å) for "B" it is possible to calc concn of these materials in the oils tested. V. B.

1833. Observations on the toxicity of white oil. R. N. Chaudhuri and N. K. Chakravarty. *Indian J. med. Sci.*, 1952, **6**, 137–9.—3 rhesus monkeys fed ½–1 ml white oil/lb body wt/day, total dosage 36–195 ml. 2 batches of white oil used (no details given). 2 animals on one batch died within 3 weeks, third animal, on different oil, killed after 3 months. Results of histological examination given, main effect noted was on blood vessels, similar to that in argemone poisoning. Concluded that white oil is toxic and if used as adulterant for edible fat may have some link with occurrence of epidemic dropsy. V. B.

1834. Definition of wax. C. Lüdecke and F. Gieser. *Erdöl u. Kohle*, 1954, **7**, 380.—Following has been tentatively proposed by the wax group of the German Fat Technology Society. "Wax is a technical collective designation for a series of natural or synthetic materials normally possessing the following properties: at 20° C malleable to friable, coarse to finely cryst, transparent to opaque, but not vitreous; fusible without decomp over 40° C, having, slightly above the m.p., a relatively low visc, non-stringy, high temp coeff of consistency and solubility, polishable with slight pressure." V. B.

1835. Patents. U.S.P. 2,674,516 (5.12.51; 6.4.54). V. R. Hurka, assr to E. I. du Pont de Nemours and Co. An antifume composition consisting of from 28 to 38% by wt of N, N-diphenyl-1, 2-propanediamine, from 9 to 25% by wt of an oil-soluble, water-dispersible sodium petroleum sulphonate, from 5 to 11% by wt of triethanolamine, from 35 to 50% by wt of a water-immiscible organic solvent mixture having an aniline point of less than 50° C, and containing a mineral oil and a solvent which is an aromatic, naphthenic, or terpene hydrocarbon, and from 0 to 2% by wt of water.

U.S.P. 2,676,954 (23.11.51; 27.4.54). J. M. Butler, assr to Monsanto Chemical Co. Wax composition containing a completely esterified styrene–maleic anhydride heteropolymer.

U.S.P. 2,676,893 (21.4.51; 27.4.54). A. E. Budner, assr to S. C. Johnson and Son. A film-forming water-in-oil dispersion for treating wood surfaces. D. A. R.

DERIVED CHEMICAL PRODUCTS

1836. The chemical industry looks at L.P.G. H. Groppe. *Petrol. Refin.*, 1954, **33** (6), 141–3.—A discussion of the present sources and quantities of C_2, C_3, and C_4 hydrocarbons used by the chemical industry, the chemicals produced, and the probable future production. It is estimated that by 1955 the consumption of propane and *n*-butane will be 50% greater than in 1953. R. D. S.

1837. Technical syntheses of phenol. P. W. Sherwood. *Erdöl u. Kohle*, 1954, **7**, 362–6.—U.S.A. phenol production planned for 280,000 tons in 1955, basic raw material is C_6H_6, obtained from petroleum. 3 main procedures for phenol production available: C_6H_6 sulphonation (liq phase, vap phase, or extractive); through cumene hydroperoxide, and by chlorination of C_6H_6 (with HCl or Cl). Main features of each are briefly described. V. B.

1838. Patents. U.S.P. 2,674,603 (14.2.50; 6.4.54). J. J. Wehrle, assr to Socony-Vacuum Oil Co. Antioxidant from thiols and phosphorus halide.

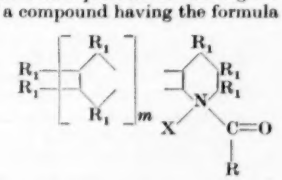
U.S.P. 2,674,613 (9.3.50; 6.4.54). J. W. Nelson, assr to Sinclair Refining Co. Preparing organic acid compositions by oxidizing microcryst wax containing 34–55 carbon atoms/mol in the presence of a stoichiometric excess of oxygen, *ca* 0·1–4·0% by wt of potassium permanganate as an oxidn cat, and 0·1–4·0% by wt on the wax of seed material derived from a prior reaction.

U.S.P. 2,674,633 (7.12.48; 6.4.54). O. Reitlinger. Preparing organic chlorides by reacting in the gaseous phase hydrocarbons or partially chlorinated hydrocarbons with hydrogen chloride and oxygen at temp between *ca* 400° and 490° C in the presence of a cat.

U.S.P. 2,675,328 (25.5.51; 13.4.54). T. J. Wishlinski and F. W. Schuessler, assrs to Standard Oil Co. Preparing a stable homogeneous polyvalent metal sulphonate-containing adjunct for bituminous materials.

U.S.P. 2,675,407 (10.4.52; 13.4.54). S. G. Gallo and C. E. Morrell, assrs to Standard Oil Development Co. A method of oxidizing *cyclo*alkanes which comprises subjecting a *cyclo*alkane dissolved in tertiary butyl alcohol, the tertiary butyl alcohol being present in an amount of *ca* 0·1–3 pts by wt per pt of *cyclo*alkane, in the liq phase and at a temp in the range of *ca* 100°–200° C to oxidn by means of an oxygen-containing gas.

U.S.P. 2,676,926 (3.7.50; 27.4.54). J. O. Smith, Jr, and A. R. Jones, assrs to Standard Oil Development Co. A petroleum hydrocarbon product containing an oxidn inhibiting amount of a compound having the formula:



wherein the R_1 groups represent hydrogen, hydrocarbon groups containing 1–20 C atoms, hydroxyl groups, sulphydryl groups, alkoxy and mercaptide groups with alkyl radicals containing 1–20 C atoms, nitro groups, and halogen groups, *m* is 0–1, R is a hydrocarbon radical containing 1–30 C atoms, and X is a halogen. D. A. R.

COAL, SHALE, AND PEAT

1839. Workable peat resources of Scotland. R. J. Sarjant. *Nature, Lond.*, 1954, **173**, 1174.—The amount of available peat is estimated at 500 million tons. For utilization the most difficult problem is to reduce economically its moisture content to the level at which it can be burned. Short descriptions are given of closed- and open-cycle gas turbines using peat as fuel, and as a result of experiments on these units a 200-kW unit will be constructed. H. C. E.

1840. New method for investigating the chemical structure of combustible minerals, and the chemical structure of Estonian shale–kukersite. Kh. T. Raudsepp. *Izvest. Akad. Nauk. SSSR., Otdel. Tekh. Nauk*, 1954, 130–6.—Ground (200 mesh) shale freed from carbonate with acetic acid, followed by silicate removal with $CaCl_2$ soln. Resultant material treated (175°–200° C) in sealed tubes with conc (sp. gr. 1·87–2·1) HI and reaction product extracted with Et_2O. Free I determined, indicating thereby amount of H used in reduction. Kerogen is broken down to Et_2O-sol low mol. wt. products. Concluded that kerogen macro-molecule consists of hydrocarbon portions joined by ether linkages; hydrocarbon portions consist of aromatic rings (1 per 13–17 C atoms in the kerogen) joined by aliphatic chains. V. B.

MISCELLANEOUS PRODUCTS

1841. Plants for the production of anti-knock compounds. Anon. *Engineer, Lond.*, 1954, **198**, 120–3, 151–5.—Brief historical outline of use of T.E.L. in motor and aviation gasoline, with description of recently commissioned Br extraction plant and T.E.L. manufacturing plant of Associated Ethyl Co. Choice of Amlwch, Anglesey, for former plant, depended on suitable Br content and temp of sea water, also reasonable distance from T.E.L. plant at Ellesmere Port, Cheshire. Br extraction from sea water is accomplished by acidification to correct pH with H_2SO_4 (made on site by burning iron pyrites and oxidn of SO_2 to SO_3), then blowing Cl through the acidified H_2O. Cl is brought in as liq and vaporized by hot H_2O. Liq C_2H_4 imported from Wilton is vaporized and bubbled through liq Br to give ethylene dibromide, which is transported to Ellesmere Port. In case of breakdown in liq C_2H_4 supplies, stand-by plant is installed which produces C_2H_4 by dehydration of C_2H_5OH. For production of T.E.L. at Ellesmere Port, main materials required are Pb, Na, C_2H_4, C_2H_6, Cl. Pb imported from Australia, Na and Cl produced electrolytically, hydrocarbon gases piped from "Shell" Stanlow refinery. Liq Na made by electrolysis of fused NaCl and stored in induction-heated storage tanks at 120° C, blanketed by N_2. Cl produced at cell anodes, dried by H_2SO_4, compressed to 30 p.s.i. and liquefied by cooling to −50° C, using CO_2 refrigeration. Additional liq Cl imported. Pb melted in low frequency induction-heated vessels, transferred through resistance-heated steel pipes, and alloyed with liq Na, alloy being cooled by Dowtherm and flaked. Ethyl chloride made by reacting C_2H_6 with Cl and dist; ethylene dichloride by reacting C_2H_4 with Cl and dist. T.E.L. produced by adding excess ethyl chloride to flaked alloy in autoclave; exothermic reaction, 25% Pb is converted to T.E.L. Excess ethyl chloride first dist off and then the T.E.L.; surplus Pb residues recovered and re-used. "Octel" anti-knock motor fluid blended from T.E.L., ethylene dichloride, ethylene dibromide and kerosine, and dyed yellow. Aviation mix dyed blue and contains no ethylene dichloride. N_2 blanket for handling Na and alloy produced either by cracking NH_3 and burning off H_2 or else by burning H_2 from Stanlow refinery, and absorbing CO_2 from hydrocarbon impurities in NaOH. Flowsheets of both works, and various photographs. Comprehensive descriptions of all services, including elaborate drum preparation and safety facilities. A. C.

1842. Radioactive tracers in insecticide research. Pt III. P. A. Dahm. *Soap, N.Y.*, Nov. 1953, **29** (11), 41.—Studies conducted with P^{32} and S^{35} labelled insecticides are reviewed. 20 refs. M. V. J.

CORROSION

1843. Corrosion protection of metals by inhibitors. A. Bukowiecki. *Schweiz. Arch. angew. Wiss.*, 1954, **20**, 169–86.—Review. Corrosion mechanism and suitable inhibitors discussed for following applications: (1) approx neutral aq liq; inhibitors favouring oxide film formation (*e.g.* Na_2CrO_4, $NaNO_2$), inhibitors acting as seals to oxide films (*e.g.* NaH_2PO_4, C_6H_5COONa), cathodic acting inhibitors (*e.g.* Na metaphosphate), inhibitors yielding gel-like ppt (*e.g.* Na silicate), wetting agents (*e.g.* aryl alkyl sulphonates), emulsifying oils; (2) acid aq soln; organic adsorption inhibitors (*e.g.* dibenzyldisulphide), inorganic adsorption inhibitors (*e.g.* Na halides), heavy metal salts (*e.g.* As, Sb); (3) aq alkaline soln (*e.g.* silicates); (4) vapour phase inhibitors (*e.g.* organic amines); (5) inhibitors for org liq (*e.g.* rust preventive soaps; water itself (which can inhibit certain reactions such as attack of Mg by anhydr MeOH), organic P compounds as inhibitors for motor oils). 121 refs. V. B.

1844. Corrosion investigating techniques. J. B. Armstrong. *Petrol. Refin.*, 1954, **33** (6), 176–9.—A discussion of the field and lab techniques that can be used in making an investigation of potential corrosion problems and in evaluating the merits of inhibitors or other corrective measures. R. D. S.

ENGINES AND AUTOMOTIVE EQUIPMENT

1845. Coastal vessel with free-piston gas generators and gas turbines. Anon. *Gas Oil Pwr*, 1954, **49**, 127–8, 131.—The vessel uses residual fuel. To this end the gas generators are 2-stroke diesel engines with very high supercharge and the injector holes are 0·5 mm (direct) and 1·0 mm (prechamber injectors) in dia. The residual fuel bunkers contain 27-kW heating elements which raise the temp of the fuel to 30° C so that it can be pumped. After further heating the fuel is centrifuged at 90° C, and it is stored in lagged supply tanks. The centrifuging plant treats the daily fuel supply in 6 hr.

The electrical generating sets are run, and the main engines are started, on dist fuel, diesel, or gas oil. H. C. E.

MISCELLANEOUS

1846. Operational research : its application to the oil industry. D. C. Lennon. *Petroleum, Lond.*, Apr. 1954, **17** (4), 130–3.—Operational research is concerned with compressing qualitative data into its most quantitative form, *i.e.* to reduce the field in which guesswork or intuition are the main factors. This article describes the use in the oil industry. G. H. G.

1847. The petroleum industry and the D.S.I.R. Anon. *Petrol. Times*, 6.8.54, **58** (1487), 811.—A review is given of the 1952–53 Report of the Advisory Council of the Department of Scientific and Industrial Research.

Subjects dealt with include work on the Fischer–Tropsch synthesis pilot plant at the Fuel Research Station, flow properties of residual fuel oils, research on lubrication and wear, piston assembly and oil consumption, launching greases, scavenging process in marine diesel engines, and replacement of part of the creosote by cheap petroleum oils in special fuels containing pitch. G. A. C.

1848. Petroleum abstracts. Anon. *Petroleum, Lond.*, Feb. 1954, **17** (2), 62–3.—Abstracts are the photo-geology in oil exploration and petroleum chemicals in Germany. G. H. G.

1849. What is the demand for ethylene? H. A. Mitchell. *Oil Gas J.*, 9.8.54, **53** (14), 95.—Figures are presented on uses and demand for ethylene, and effect on L.P.G. of use of propylene and butylene is discussed. Ethylene demand rose from 1·5 billion lb in 1950 to 2·1 billion in 1953 and is expected to be 3 billion lb by 1956. G. A. C.

1850. Terms of Persian oil settlement. Anon. *Petrol. Times*, 20.8.54, **58** (1488), 854.—Statements by the Anglo-Iranian Oil Co, the British Foreign Office, and the Delegation are given regarding the agreement in Teheran with the Persian Government on the settlement of claims in the oil dispute. Press comments are also given, together with some financial and other details. G. A. C.

1851. Segmented-mirrors solar furnace for high intensity thermal radiation studies. R. Garden. *Rev. Sci. Instrum.*, 1954, **25**, 459–63.—A solar furnace is described, in which an array of many small plane mirrors is used to produce radiation of practically uniform density (up to *ca* 5·5 cal/cm² sec) over an area 5 cm square. This relatively large area of irradiation is required for experiments in which edge effects must be kept to a minimum, and could not have been obtained by means of a conventional continuously curved mirror of reasonable focal length and of moderate cost.

The performance of the segmented-mirror furnace over a 15-month period is analysed. (Author's abstract.) H. C. E.

1852. Ministry of Fuel and Statistical Power Digest for the year 1953. Anon. *Petrol. Times*, 9.7.54, **58** (1485), 699.—A review of this annual production is given, and the lack of a convenient comprehensive account of the supply and disposal of oil for the previous year is criticized but remedied by tables showing total supply of crude, process, and shale oil, also supply and disposal of refined products for previous 3 years. G. A. C.

1853. The new education scheme of the Institute of Fuel. D. T. A. Townend. *J. Inst. Fuel*, July 1954, **27** (162), 353.—Background of the first education scheme is recalled, together with its main features, and it is shown how the practical weaknesses experienced with it are remedied in the new scheme. Aspects discussed are : importance of adequate supply of fuel technologists ; qualifications and training in fuel technology to professional standards ; and the various approaches to qualification. An estimation is made of the number of professionally qualified fuel technologists needed to ensure proper management of Britain's fuel usage. D. K.

BOOK REVIEW

Oil in the Middle East. Its Discovery and Development. Stephen Hemsley Longrigg. Issued under the auspices of the Royal Institute of International Affairs. London : Oxford University Press, 1954. Pp. xiii + 305. 25*s*.

Few associated with the petroleum industry could fail to appreciate the masterly way in which Middle East oil affairs have been handled in a volume of 300 pages with several useful maps and a comprehensive index. The material collated and admirably assembled could only have been the result of painstaking investigations by one intimately connected with those undertaking petroleum development in that troubled region over a period of many years. The author's personal acquaintance with the leading personages who figure in the drama enhances the value of his remarks. Within the scope of fifteen chapters the progress of Middle East oil developments is traced from its inception to the final Iranian imbroglio in 1953. The obvious difficulty of recording events chronologically has been partially overcome by dividing the contents into sections devoted to aspects of defined periods related to political factors or other circumstances.

A preliminary chapter gives a brief but excellently summarized description of the physiographical and geological features which induced interest in Middle East oil, and outlines the early local endeavours to exploit seepage oils or bitumen. Several pages are devoted to an account of conditions that existed when the vast Ottoman Empire was ruled by a despotic monarch who discouraged the admission of foreigners into his Arabian domains. Reference is made to the determined and successful efforts of Germany to secure a rail outlet to the Persian Gulf, and with it to obtain the mining rights, including petroleum, along the proposed route of the railway. Appreciating the importance of oil, the Sultan of Turkey decreed the transfer of petroleum revenues to his own privy purse by firmans in 1890 and 1899 ; and it is related how at that period a certain Gulbenkian acquainted with the oil manifestations of Mosul was then interesting himself in the matter of concessions.

In Chapter II the circumstances which led a wealthy Australian, William Knox D'Arcy, to interest himself in Persian oil prospecting are described, together with an outline of the conditions under which a blanket concession was granted. This is followed by an account of some of the enormous difficulties that had to be overcome in prospecting waterless, resourceless terrain devoid of roads and inhabited by lawless tribes unfriendly to foreigners and disinclined to co-operate. The virtual failure of a succession of wells sunk on selected structures regarded as favourable by experts was so discouraging and expensive that even D'Arcy became alarmed, and the assistance of others with ample funds was sought. Although not specifically mentioned, it is well known that the agreement between D'Arcy and the Burmah Oil Company arose from the friendly intervention of Boverton Redwood and the sympathetic consideration of John Cargill. This association must be regarded as one of the highlights of British enterprise ; but

even with that powerful help the results of a number of expensive tests with the tools then available was so disheartening that an abandonment was seriously entertained at one stage of the operations. Due largely to the persistence and enthusiasm of J. B. Reynolds, a well-known petroleum engineer who could not be persuaded to abandon a test at Masjid-i-Sulaiman, a flow of high quality oil was struck at 1180 ft in May 1908. The success of a second well satisfied the directors that the concession warranted active development and led to the formation of the Anglo-Persian Oil Co in 1909 with a capital of £2,000,000, having Lord Strathcona as a distinguished chairman.

Notwithstanding the delays and troubles occasioned by the war of 1914–18, exploitation progressed at such a pace that town sites were built, water supplies made available, roads constructed, and pipelines laid to a refinery built at Abadan within territory held by the friendly Sheikh of Mahommerah. Having decided on the use of oil for war vessels, the Admiralty was at this period anxious to obtain assured supplies of fuel from a source in British control, and decided to consider financial participation in this enterprise. On receiving a favourable report from a mission sent to Persia in 1912, Royal assent was given to a 51% holding in the company just two days before the outbreak of war in 1914. The appointment of Sir G. Greenway in succession to Lord Strathcona as chairman was announced the same year.

A detailed account is given of the many futile and costly efforts to discover an oilfield in Egypt along the borders of the Gulf of Suez, where manifestations of oil were numerous, until in 1909 oil of good quality was struck at Jemsa at 1290 ft. This revelation led to the entry of the Shell group, who negotiated prospecting licences over a considerable area on the African and Arabian sides of the Red Sea. Their activities led to the opening of a valuable field at Hurghada in 1913 at a most propitious moment for Egypt and the Allies.

Eight pages are devoted to the struggles of competing interests to secure oil prospecting licences in Turkish Arabia (Mesopotamia, Palestine, Syria) and the circumstances that surrounded the formation of the Turkish Petroleum Company. Despite the fact that the conflicting parties had reached some kind of agreement for collaboration, no one appears to have received satisfaction, and the decision of Turkey to join with the European group, coupled with dissensions, altered everything. The disagreements and recriminations that preceded and followed the break-up of Arabia into a number of states on the termination of hostilities are well described, although much is omitted that might excuse some of the strong feelings that the oil situation aroused amongst aspirants for concessions. Oil did not grease the wheels of diplomacy, and the eventual solution was the outcome of far more bickering than would be conjectured from the book. An account of the troubles in fixing new state boundaries and the appeasement of rivals for power would fill a volume, but as regards Iraq, which included Mesopotamia, the formation of a kingdom under King Feisal was a pacifying influence that facilitated the negotiations for oil concessions in the Mosul region, where by agreement with France the Syrian frontier secured for Iraq most of the promising oil territory. A readjustment of the frontier with Persia gave to Iraq some interesting structures in the transferred territories, where in 1923 a valuable oilfield was located.

Only limited space is devoted to the contentious questions that arose in distributing the enemy-held portion of the Turkish Petroleum Co's shares and in determining the allocations of participations to international interests in the projected new company to explore the Iraq oilfield region. In spite of British opposition, the U.S. Government, basing their claims on the agreed open-door policy, was insistent upon some recognition of the claims of their nationals for a participation, and considerable notice was given to the subject in the British and U.S. Press. At one stage acrimonious exchanges reached such a pitch that Anglo-American relations were endangered. Fortunately wiser counsels prevailed, and an acceptable solution was found by Anglo-Persian sharing with American nationals their preponderent participation.

There is also little said regarding the spirited resistance of Turkey to the fixing of a frontier that deprived her of the Mosul vilayet where oil prospects were so encouraging; indeed, the reluctant consent was obtained only by an agreement which gave them a participation in oil revenues for twenty-five years.

The final outcome was a distribution to France, Anglo-Saxon group, A.P.O., and the American group of 23·75 each, and Gulbenkian 5%, compensation for the release of 23·75 A.P.O. major shares taking the form of a 10% share of production. The first payable oil struck in Iraq was in 1923 at Naftkahna on a structure within the transferred territory extending into Persia; but a surprising number of failures resulted from drilling on well-defined structures in Iraq, until in 1927 a powerful gusher was struck at Babu Gurgur, Kirkuk, near an active oil seepage which had been known for centuries. This discovery led to the eventual delineation of an oilfield that has few equals in the world for size and productivity.

Only those with inside knowledge of events could possibly know all the circumstances that surrounded the struggle by outside interests for a holding in the Iraq oilfields. The original terms of the Iraq concession described on p. 73 provided for a definite selection of plotted acreage from a blanket concession within a prescribed period during which no oil in remunerative quantities had been discovered. After two deferments of the period a decision was made, but it was felt that other arrangements than those stipulated in the 1925 T.P. Co concession would better meet a difficult situation. As a result of prolonged and contentious negotiations an international financial group known as B.O.D. was allotted all land west of the Tigris, and the Turkish Petroleum Co all land east of the Tigris, thereby permitting unhampered structural exploration and development. Sponsored by a powerful independent British group, the B.O.D. found it necessary to combine with international interests to fulfil the very onerous and exacting conditions imposed at a time when the existence of payable oil was unproved, and sceptics were numerous and outspoken; but with the help of Italian, French, Swiss, German, and Dutch participation it became possible to meet commitments and embark on the exploration of a 46,000 sq. mile concession in the name of the Mosul Oilfields Ltd. The publicized belief that only heavy oil would be found west of the Tigris discouraged optimism, and even the author's comments greatly underrate the enormous difficulties encountered in placating those representing conflicting interests when endeavouring to begin operations with three rigs within the prescribed period for commencement.

Subsequent developments, due to the difficulty of disposing of the heavy oil which was struck in abundance by the Mosul oilfields on four domal structures, and the failure to find light oil, are described on p. 79. The disinclination of some members to continue contributions in a global period of financial stress led to negotiations with the Iraq Oil Co, who by agreement with the authorities took over the concession. Although further test wells were made on pronounced structures, no success resulted until in 1939 light oil was struck at Ain Zalah at a greater depth than formerly tested.

Chapter VII is devoted to an account of events which led to the discovery of oil in the Persian Gulf islands and Arabia. A few insignificant manifestations of oil led a British mining company to secure oil concessions from the rulers of Bahrain, Saudi Arabia, and Kuwait. As oil exploration involved expenditure beyond the means of the instigators, attempts were made to farm the concession off in London, but on one pretext or another it was turned down by the many powerful oil groups approached.

This failure led to attempts in the U.S.A., where the Gulf Oil Co became interested but reluctantly dropped the idea

due to prior arrangements for mutual action in the Persian Gulf. Fortunately, through the intervention of a friendly agent of British extraction in New York, the Standard Oil Co of California was induced to investigate the Bahrain situation, and in consequence of a report received decided to undertake prospecting. The first well sunk on the clearly exposed dome near Awali struck flowing oil of light gravity in Cretaceous limestone in May 1912 at under 3000 ft. This surprising and spectacular success in strata older than those in which oil was developed in Iran and Iraq aroused world-wide interest from the oil fraternity in the region, and an immediate scramble for concessions ensued.

The spirited contest between conflicting major interests for concessions in Saudi Arabia and the neighbouring states led to events which had an Arabian Nights flavour with bushels of golden sovereigns being handled like potatoes, together with vague promises of future fantastic rewards. Shared by the Gulf Corporation and the I.P. Co the Kuwait concession was acquired for a mere pittance from the Eastern and General, and immediately responded to drilling after a geophysical survey had fixed a stratigraphic high. In 1938 flowing oil was struck at 3675 ft in Kuwait, and further drilling disclosed 1000 ft of petroliferous Cretaceous sandstones over some 30 sq. miles yielding oil of light density. In 1935 a concession to drill on the barren peninsula of Qatar was granted to the Anglo-Persian oil group, and in 1939 a 5000-b.d. well of light oil was struck in Jurassic limestones at 5500 ft.

Chapter VIII records the depressing influence of the war on oilfield development in the Persian Gulf region. Troubles arose in Persia due to military occupation, general disorganization, and diminution of royalties when money was badly wanted. Revision of concession terms favourable to Persia failed to suppress a Nationalistic movement that aimed at the cancellation of the oil concession and transference of the remunerative oil industry to the government. In Chapter IV is found much about the utility of Bahrain as a refining centre during the war, and the importance of Saudi Arabian oil pumped to the island through a submerged pipeline. Chapter X describes the phenomenal number of successes that followed oil exploration in Persia, and the extensive works undertaken for the development of oilfields and transmission of oil to an ever-enlarged refinery at Abadan. The magnitude of the installations built to house some 50,000 employees and provide for their needs and welfare is well described.

The decision to nationalize the Persian oil industry was apparently not taken very seriously at first by the company, and not until it became a political factor without regard to economics did negotiations assume a dangerous phase in the hands of a fanatical prime minister who usurped full powers in Teheran. In 1951 the situation became so serious, after every attempt made for reconciliation had failed, that the lives of British residents were endangered and wanton damage was done to property by the irresponsible element. The decision to order the withdrawal of all British staff was made only after the imposition of irritating restrictions that rendered life intolerable, and the last contingent was conveyed to Basra on 3 October 1951, leaving most of their belongings behind.

The potentialities of the delta region around Basra had long been the subject of speculation amongst oil-men, and the relative merits of many proposals for its exploration had been considered in Baghdad. Recognizing the need for expensive exploration, a new concession covering country not already leased was granted to a company controlled by the I.P.C. in 1938; and the proof of oil in Kuwait in the same year gave the Basra region especial importance. The successes that attended deep drilling in the Basra area are described on p. 185 *et seq*, together with an account of the masterly way in which difficulties were overcome amidst uncongenial surroundings. The great depth of nearly 12,000 ft, at which oil was struck was regarded as a particularly favourable factor for ensuring longevity of production and high potential yield of wells.

The remainder of the book deals comprehensively with the many political, economic, and sociological problems that have arisen as the result of oil discoveries in the Middle East. Dissatisfaction with their share of the rewards from oil has led to many changes in the terms of the original agreements, and numerous modifications of one kind or another in the terms have entailed successive sacrifices of the oil companies. The gold clause is one that has always introduced complications in royalty calculations due to fluctuating exchange values; and a disposition to replace royalties by a sharing of profits appeared to open a better line of approach. A sudden accretion of wealth by people who had hitherto lived a spartan life has led to great social upheaval and caused inordinate demands for higher wages and other free services and allowances. Enormous expenditure has been incurred in the building of townships and ports and the construction of trunk pipelines across inhospitable desert from the oilfields to the Persian Gulf and Mediterranean ports, and right-of-way payments have proved, it is shown, to be a fruitful source of revenue and benefit to states over which they run. The unfortunate Arab–Israel quarrel threw into disuse one major trunk line to Haifa, together with a refinery.

Competition for oil rights on the neutral territory lying lying between Kuwait and Saudi Arabia led to high bids and its eventual successful development, and the procuration of exploration permits along the Trucial Coast proved a very unexpected and welcome source of revenue to penurious sultans, sheiks, and rulers along that desert Red Sea strip. Applications for off-shore concessions proved another disturbing factor due to the difficulty of defining their limits and extent in relation to shore grants.

A study of this important compilation of facts and figures dealing with wealth and resources beyond the dreams of any recorded Arabian Nights story inevitably leaves one in a disturbed state of mind, for no one can foresee what will be the eventual outcome of events which have so rapidly changed the fortunes and lives of penniless peoples inhabiting for the most part barren waste. It is obvious that nothing but close collaboration between the major oil companies and friendly relations with those administering the various countries could prevent a major catastrophe. One dare scarcely visualize what might happen if an irresponsible mob or reckless marauder overran the rich oilfields of the Middle East.

Although Middle East oil developments owe their existence to the enterprise, skill, and ingenuity of foreigners in the face of appalling difficulties, little local credit is usually given to those who pioneered an industry that changed the fortunes of so many. Whilst admitting that the great oil companies have performed a stupendous task and deserve credit for a magnificent achievement, there are some who think the advancement has been too rapid and revolutionary for economic stability and the contentment of a restive population. That there is another side than that presented in the relations between governments and the companies is known, and it may be that had earlier recognition been given to some complaints such a serious situation might have been avoided.

The book is heartily recommended to all interested in Middle East oil affairs. A. B.-T.

ADDITIONS TO THE LIBRARY

ASTM Standards on Gaseous Fuels. ASTM Committee D-3 on Gaseous Fuels. Philadelphia, Pa: American Society for Testing Materials, 1954. Pp. 184. $2.50.

This compilation of current ASTM standards for gaseous fuels contains details of twelve methods. Three of these relate to the sampling of natural gas, manufactured gas, and LP gas respectively, one to the measurement of gaseous samples, and eight to methods of test. The latter are for analysis (natural gas by volumetric–chemical method; natural and related gaseous mixtures by mass spectrometer; carburetted water gas by mass spectrometer), water vapour content by dew-point temperature, calorific value by water-flow calorimeter, specific gravity, sulphur in petroleum products and LPG by CO_2–O_2 lamp, and vapour pressure of LPG. Five of the methods are entirely new and five are revisions of previous editions.

Financial Analysis of the Petroleum Industry for 1953. Frederick G. Coqueron. New York: Petroleum Department, Chase National Bank, June 1954. Pp. 36.

Proceedings Thirty-second Annual Convention, Natural Gasoline Association of America. Tulsa, Oklahoma: The Association, 1954. Pp. 108.

This Convention was held at Houston, Texas, in May 1953, and the technical forums covered laboratory procedure and analysis (3 papers); increasing yields of ethane and propane (3 papers); corrosion in natural gasoline operations (2 papers); operations (3 papers); liquefied petroleum gases (2 papers); and statistics (2 papers).

The fifteen papers are reproduced in full, and there is a report of the general sessions which included papers on submersible compressor barges, on the use of light ends, and the Hanlon Award Address.

Thirty-fourth Annual Report of the Research Council of Alberta, 1953. Edmonton: Research Council, 1954. Pp. 41. 5 cents.

1954 SAE Handbook. New York: Society of Automotive Engineers, 1954. Pp. 1096.

There has been no change in the SAE Classifications of crankcase, transmission, or axle lubricants, but the kinematic viscosity figures in the tables of corresponding ranges have been slightly amended to meet current changes in viscosity conversion factors. The mass of data on steels, on ferrous castings and materials, on non-ferrous metals, and on non-metallic materials including fuel and oil hoses, lubricating greases, and hydraulic fluids, cannot fail to be of interest and value.

British Standards Institution Yearbook 1954. London: BSI, 1954. Pp. 508. 12*s*. 6*d*.

Contains detailed information as to the activities of the BSI and lists all British Standards current at 31 March 1954. Details are also given of the work in hand.

Production of High-BTU Oil Gases from Crude Shale Oils. E. B. Shultz, Jr., J. J. Guyer, and H. R. Linden. Institute of Gas Technology Interim Report. Chicago, Ill.: The Institute, February 1954. Pp. 24. $2.50.

Difficulties in obtaining sufficient quantities of high-quality gas making oils to meet peak and winter demands for gas in utility plants have led to the investigation of the use of shale oil for the production of high-BTU gases.

The conclusions drawn in this report and supported by graphical and tabular data, show that shale oil yields a gas approximating that obtained from natural petroleum of equal C–H ratio. When scrubbed and blended with inert gases to a desired heating value and specific gravity, the shale oil gas was of equal or greater value as a substitute for high-methane natural gas than petroleum oil gases of similar heating value.

The Durability of Road Tar. A. R. Lee and E. J. Dickinson. Road Research Technical Paper No. 31. London: HMSO, 1954. Pp. 48 + vi. 2*s*. 6*d*.

The behaviour of tars used for road surfacing in the U.K. is being investigated by the Road Research Laboratory and the BRTA. One aspect aims at improving the quality of the tars, and this paper summarizes that work so far. Resistance to atmospheric oxidation appears to be important, and a laboratory has been devised. Two methods of improving oxidation resistance consist of removing the phenolic constituents by washing with aqueous caustic soda, or oxidizing them by air blowing in the presence of a catalyst. The work is continuing.

Review of Benzole Technology 1953. The National Benzole and Allied Products Association. London: The Association, 1954. Pp. 78.

This comprehensive summary of papers and patents, with over 600 literature references, of interest to the benzole industry continues the work first started in 1931 by the National Benzole Association.

Flüssig-Flüssig-Extraktion Erfahrungsaustausch. Frankfurt an Mair: DECHEMA, Deutsche Gesellschaft für chemisches Apparatewesen. Pp. 57. DM 22.80.

This is one of a series of publications in the field of chemical engineering under the auspices of DECHEMA. The present article is on liquid–liquid extraction by Dr K. Grob and includes a nomenclature list, a brief account of liquid–liquid extraction, batch processes, concurrent processes, and of countercurrent processes both with and without reflux. Extraction processes, both on the laboratory and large scale, are described. Finally, methods are discussed for the calculation of experimental results, including the calculation of the number of theoretical stages.

The Services Rubber Investigations. Ministry of Supply. London: HMSO. Pp. 324.

Silicones and their Uses. Rob Roy McGregor. London: McGraw-Hill Publishing Co. Ltd. Pp. xv + 302.

Petroleum Microbiology. Ernest Beerstecher, Jr. Houston: Elsevier Press. Pp. xv + 375.

Absorption Towers. G. A. Morris and J. Jackson. London: Butterworth's Scientific Publications in association with Imperial Chemical Industries Ltd. Pp. xi + 159.

Vapour Pressure of Organic Compounds. T. Earl Jordan. New York: Interscience Publishers. Pp. ix + 266.

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OILFIELD EXPLORATION AND EXPLOITATION

GEOLOGY

1854. Recent progress in the study of the mineralogy of fine-grained sedimentary rocks. C. Alexanian, P. E. Rouge, and A. Vatan. *Rev. Inst. franç. Pétrole*, 1954, **9** (6), 243–61.—Fine-grained rocks constitute a large proportion of sedimentary rocks, and are particularly important in oilfield work. Their mineralogy is not well known because classical petrographical methods cannot be applied in general. However, X-ray techniques have proved valuable, and in recent years there have been marked advances.

The principles of the X-ray powder technique are briefly described, and there is a note on a recording apparatus which uses a Geiger–Muller tube to determine the intensity of the X-rays as the specimen is rotated at a slow, uniform rate. This apparatus has some advantages over the photographic equipment. The positions and intensities of the peaks recorded are diagnostic.

The preparation of the samples is briefly described, and there are notes on the characteristics of the diagrams recorded for certain clays and other minerals commonly found in fine-grained rocks.

The clay minerals can be an index of environment, and some of Millot's views on this are given. Correlation is also possible. In oilfield work clays are of importance in muds, as material in rocks being acidized, and in swelling formations. They also affect the properties of reservoir rocks and the values of the parameters recorded in electric logging. G. D. H.

1855. Palynology and stratigraphy. C. Sittler. *Rev. Inst. franç. Pétrole*, 1954, **9** (7), 367–75.—The study of fossil plant spores and pollen, palynology, has developed rapidly since it was applied to pre-Quaternary sediments. Spores and pollen have been found mixed with cuticles and vegetable tissue, etc., and they have been noted not only in coals, lignite, and torbanite, but also in fresh water marls and limestones. They are rare in marine deposits.

Spores and pollen are carried by the wind and insects, at times for great distances, and eventually deposited on the land or in the oceans, being destroyed in most cases. However, in anærobic environments they can be preserved. Humic acid aids preservation. The exine is preserved apparently unaltered. Pollen grains range 10–150 μ in dimensions. Some plants have 2 types of spores; megaspores over 200 μ and microspores of 20–150 μ in dimensions, the latter in general being most useful because of their being more widely spread. Size and form, the germinal openings, and the sculpture and structure form the basis for identification. Pollen analysis makes use of the statistical uniformity at a given time in an area, and the evolution of the flowers with time. The pollen grains must be segregated from the sediments by chemical or other treatment and mounted. Some pollen grains will be identifiable, while others may have unknown affinities, yet may be usable. Counts give the percentages of different species permitting a pollen spectrum to be drawn for the different levels. The successive spectra form a pollen diagram, of which there are a number of types.

Work on the Quaternary and parts of the Palæozoic is well advanced, and much has also been done on Tertiary deposits in the past 10 years, but work on the Mesozoic is more limited. The sedimentary types investigated include coals, lignites, torbanites, and saline series, and crude oils have yielded pollens which, apart from age indications, may be of interest with regard to origin, migration, and porosity and permeability in the reservoir rocks. G. D. H.

1856. Oil possibilities in Black Africa. V. Hourcq. *Bull. Ass. franç. Tech. Pétrole*, May 1954, **105**, 169–98.—Africa, which represents 20% of the world's land areas, has given only 0·2% of the oil production. A brief account is given of the geology and geological history of Africa. The geo-

synclinal zones and coastal and interior basins are enumerated, and their extent indicated. The various areas and formations with oil indications are noted, and possible traps and structures are briefly considered. The different coastal basins are discussed separately, with a short account of any exploratory work which has been carried out. An attempt is made to assess the possibilities by using as yardsticks the results obtained in other parts of the world, *i.e.* making use of the age distribution of oil production, and of the output per unit area or volume of sedimentary rocks. Attention is also drawn to the intensity of exploratory effort in different parts of the world. G. D. H.

GEOPHYSICS AND GEOCHEMICAL PROSPECTING

1857. Patents. U.S.P. 2,670,926 (9.8.51; 2.3.54). B. W. Sewell and J. M. Camp, assrs to Standard Oil Development Co. Seismograph cable handling device.

U.S.P. 2,671,375 (12.12.50; 9.3.54). F. G. Boucher, assr to Standard Oil Development Co. Seismogram trace analyser.

U.S.P. 2,672,204 (30.8.49; 16.3.54). T. C. Poulter, assr to Institute of Inventive Research. Method and apparatus for seismic exploration.

U.S.P. 2,672,944 (4.11.48; 23.3.54). J. P. Minton, assr to Socony-Vacuum Oil Co. Seismic prospecting system. J. M. S.

DRILLING

1858. Reconnaissance and exploitation by directional drilling in the Alsace potash basin. G. Lallemand. *Bull. Ass. franç. Tech. Pétrole*, May 1954, **105**, 199–218.—The first directional drilling in France was done to drain oil at a depth of 350 m below the village of Wittersheim (Bas-Rhin). 7 wells were drilled from a single site in 1951. Subsequently, in 1951 Lacq 44 was drilled directionally in search of an extension of the Lacq field. This well was deviated 450 m in a depth of 650 m, and was followed by 3 further directional holes. In 1952 6 directional holes were drilled at Stattelfelden in the Alsace potash basin, and these and other wells in the same basin are discussed. Notes are given on each of the potash basin wells, with the points and amounts of deviation, and an indication of the type of equipment used. Diagrams show the well profiles and the plan of the hole's path. Salt series are involved, and in one case deviations were made to avoid mine workings. In some cases there is a gain in time by using deviated holes, and by traversing a greater thickness of salt cutting the amount of drilling in other rocks. G. D. H.

1859. Patents. U.S.P. 2,670,547 (13.8.51; 2.3.54). I. Murata. Instrument for measuring dip and orientation of deep wells.

U.S.P. 2,670,797 (7.10.48; 2.3.54). A. L. Armentrout. Liner hanger for carrying a well liner in a casing.

U.S.P. 2,670,798 (16.7.49; 2.3.54). T. A. Owen and J. O. Owen, assrs to Perforating Guns Atlas Corpn. Oil well cementing tool.

U.S.P. 2,670,799 (20.10.50; 2.3.54). R. E. Dobbs, assr to Sun Oil Co. Collapsible pipe plug.

U.S.P. 2,670,800 (27.4.50; 2.3.54). K. R. Stohn. Junk basket well tool.

U.S.P. 2,670,925 (3.11.51; 2.3.54). J. W. des Champs. Automatic control for maintaining desired weight on a drilling bit.

U.S.P. 2,670,927 (13.5.40; 2.3.54). C. R. Edwards. Method of removing pipe from a deep well.

U.S.P. 2,670,928 (22.11.49; 2.3.54). G. P. Wagner, assr to Engineering Development Co. Bearing assembly for oil well drilling turbines.

U.S.P. 2,670,930 (12.4.50; 2.3.54). W. W. Farrar. Combination fishing tool and circulating jars.

U.S.P. 2,671,323 (15.3.51; 9.3.54). B. E. Richert, assr to Sun Oil Co. Apparatus for cooling well surveying instruments.

U.S.P. 2,671,346 (28.5.46; 9.3.54). T. A. Banning. Measuring and recording various well drilling operations.

U.S.P. 2,671,413 (18.12.50; 9.3.54). H. B. Young, assr to Mission Manufacturing Co. Split swab piston with flange type seals.

U.S.P. 2,671,509 (28.8.51; 9.3.54). M. O. Johnston. Well testing apparatus.

U.S.P. 2,671,510 (22.7.50; 9.3.54). T. B. Slick, R. W. Brown, and H. E. Metcalf, assrs to Institute of Inventive Research. Well packer and testing tool combination.

U.S.P. 2,671,511 (17.8.48; 9.3.54). B. E. Mater, assr to Baker Oil Tools Inc. Valve control for subsurface well tools.

U.S.P. 2,671,512 (12.7.48; 9.3.54). T. M. Ragan and P. H. Durant, assrs to Baker Oil Tools Inc. Well packer apparatus.

U.S.P. 2,671,513 (28.8.48; 9.3.54). E. H. Clark, assr to Baker Oil Tools Inc. Lock device for well tools.

U.S.P. 2,671,514 (8.8.50; 9.3.54). M. W. Haines, assr to McGaffey–Taylor Corpn. Well tool.

U.S.P. 2,671,515 (20.10.48; 9.3.54). J. E. Hall. Well bore cleaning scratcher.

U.S.P. 2,671,640 (19.7.48; 9.3.54). R. C. Baker, assr to Baker Oil Tools Inc. Well jarring apparatus.

U.S.P. 2,671,641 (30.7.51; 9.3.54). J. G. Hinkle. Wear adaptor for drill pipes.

U.S.P. 2,671,642 (12.11.48; 9.3.54). J. C. Stokes, assr to Reed Roller Bit Co. Coring apparatus.

U.S.P. 2,671,682 (19.10.51; 9.3.54). J. S. Page, assr to Page Oil Tools Inc. Sucker rod coupling.

U.S.P. 2,671,685 (12.10.51; 9.3.54). J. R. Ballew. Magnetic fishing tool.

U.S.P. 2,671,686 (13.12.50; 9.3.54). C. A. Anderson. Aligning device for well grappler.

U.S.P. 2,672,050 (8.3.50; 16.3.54). B. W. Sewell, assr to Standard Oil Development Co. Apparatus for locating uncemented portions of well casings.

U.S.P. 2,672,195 (11.9.50; 16.3.54). T. O. Allen, assr to Standard Oil Development Co. Small gun perforators for oil wells.

U.S.P. 2,672,199 (12.3.48; 16.3.54). P. A. McKenna. Cement retainer and bridge plug for sealing off the casing of a well at a desired depth.

U.S.P. 2,672,200 (1.3.50; 16.3.54). T. G. Patterson. Well bridge.

U.S.P. 2,672,321 (10.12.48; 16.3.54). J. A. Zublin. Apparatus for drilling a curved bore deflecting from an existing well bore.

U.S.P. 2,672,322 (14.12.53; 16.3.54). A. G. Bodine. Sonic earth boring drill.

U.S.P. 2,672,364 (27.10.51; 16.3.54). D. Ragland, assr to Standard Oil Development Co. Drilling hook.

U.S.P. 2,672,383 (6.9.49; 16.3.54). S. P. Hamer. Tubing swab for oil wells.

U.S.P. 2,672,814 (7.10.49; 23.3.54). P. Dubost, assr to Schlumberger Well Surveying Corpn. Fluid sealing and burr elimination projectile for perforator guns.

U.S.P. 2,672,934 (7.10.49; 23.3.54). K. H. Miner, assr to Lane–Wells Co. Apparatus for releasing packers.

U.S.P. 2,672,937 (27.12.49; 23.3.54). H. H. Kaveler, assr to Phillips Petroleum Co. Cementing wells with an aq slurry of hydraulic cement containing 0·1–3 wt % (based on dry cement) of a alkyl hydroxyalkyl cellulose mixed ether.

U.S.P. 2,673,069 (12.12.49; 23.3.54). P. G. Carpenter, assr to Phillips Petroleum Co. Hydrogen peroxide drilling tool.

U.S.P. 2,673,070 (28.12.48; 23.3.54). W. S. Crake, assr to Shell Development Co. Jet-type drilling jar.

U.S.P. 2,673,299 (16.9.50; 23.3.54). S. Krasnow, assr to Schlumberger Well Surveying Corpn. Shielded borehole radioactivity logging apparatus.

U.S.P. 2,673,614 (14.10.49; 30.3.54). L. A. Miller, assr to Otis Engineering Corpn. Anchoring assembly for oil well tools.

U.S.P. 2,673,615 (27.3.50; 30.3.54). G. A. Humason. Combined well head and christmas tree structure.

U.S.P. 2,673,629 (18.10.52; 30.3.54). H. J. Woolslayer, C. Jenkins, and E. A. Campbell, assr to Lee C. Moore Corpn. Portable well drilling structure.

U.S.P. 2,673,713 (18.8.49; 30.3.54). M. Ringler. Hydraulic well boring arrangement for rotary jumper method of drilling. J. M. S.

PRODUCTION

1860. Bureau of Mines liquid level gage. H. C. Hamontre, D. B. Taliaferro, C. F. McClung, and F. G. Mueller. *Rep. Invest. U.S. Bur. Min.* 5060, June 1954.—An instrument designed to locate liq levels in wells rapidly and accurately. Auxiliary equipment enables falling levels to be followed automatically. The depth is continuously indicated at the surface. The instrument, which is patented, is 6 ft long, can operate through 2-inch tubing, and is described and illustrated. G. S.

1861. Patents. U.S.P. 2,670,685 (20.4.51; 2.3.54). C. J. Coberly, assr to Dresser Equipment Co. Fluid-operated well pumping apparatus with hydraulic shock absorber.

U.S.P. 2,670,692 (20.12.49; 2.3.54). E. J. Grace, assr to Sun Oil Co. Pumping system.

U.S.P. 2,670,801 (13.8.48; 2.3.54). J. E. Sherborne, assr to Union Oil Co of California. Method of producing oil which comprises coupling 2 wave generators, one producing vibrations of a lower frequency than the other, to an oil-bearing formation to vibrate the formation with non-sinusoidal vibration waves and forcing a driving fluid through the formation.

U.S.P. 2,670,802 (16.12.49; 2.3.54). C. S. Ackley, assr to Thermactor Co. Method of increasing production of petroleum from clogged oil wells.

U.S.P. 2,672,201 (19.8.50; 16.3.54). R. H. Lorenz, assr to Pure Oil Co. Increasing production of oil wells by introducing particles of alkali metal coated with a water-sol plastic material into the formation, subjecting the particles to a temp above 150° F in the presence of water, and flushing the formation.

U.S.P. 2,672,815 (4.9.48; 23.3.54). A. F. Eadie, assr to California Research Corpn. Apparatus for pumping viscous crude oil from wells.

U.S.P. 2,672,827 (22.11.49; 23.3.54). H. E. McGowen, assr to Sid W. Richardson Inc. Gas lift valve mechanism.

U.S.P. 2,672,935 (2.7.52; 23.3.54). F. H. Braunlich and P. H. Cardwell, assrs to Dow Chemical Co. Treating wells by introducing an aq thixotropic composition comprising magnesium fluoride.

U.S.P. 2,672,936 (26.12.52; 23.3.54). D. C. Bond, assr to Pure Oil Co. Increasing permeability by introducing a viscous medium comprising an aq soln of a fluophosphoric acid which has been spent by contact with silica and applying pressure.

U.S.P. 2,673,031 (2.1.53; 23.3.54). R. G. Piety, assr to Phillips Petroleum Co. Apparatus for simulating a downhole pumping system. J. M. S.

U.S.P. 2,678,605 (7.8.50; 18.5.54). R. A. Tappmeyer, assr to Shell Development Co. Gas-lift apparatus for producing multiple zone wells.

U.S.P. 2,679,212 (23.6.52; 25.5.54). R. G. Nisle and F. H. Poettmann, assrs to Phillips Petroleum Co. Gas lift apparatus.

U.S.P. 2,679,294 (18.9.48; 25.5.54). D. C. Bond and G. G. Bernard, assrs to Pure Oil Co. Increasing production of oil wells. D. A. R.

TRANSPORT AND STORAGE

1862. Modern pipelining—to-day and to-morrow. Pt II. A. H. Newberg and E. C. Schuster. *Pipe Line News*, May 1954, **26** (5), 27–30.—Recent developments in construction planning include the use of aerial surveys over proposed lines and the preparation of weather forecasts to give max utilization of man power. Welding of pipe is usually of the submerged-arc or inert-arc type of position welding. Double jointing saves time and gives superior intermediate welds. Difficulty has been experienced in producing consistently satisfactory welds by pressure welding. Increasing use is being made of radiographing of welds using X-ray or radiographic isotopes as radiation source. Pipe coatings of petroleum or coke derivatives, and, more recently, synthetic resins, guard against corrosion, and the coatings are themselves protected from abrasion by felt wrappings, fibre sheets, or a concrete coating. Internal plastic coating is being developed for corrosion control in existing lines. Recent developments in line operation include microwave systems of control and communication, gravitometers and radioactive tracers for interface location, and automatic samplers. There is widespread use of automatic flow measuring devices, using electric strain gauges, linked with automatic control and emergency protective equipment. B. A. F.

1863. Hydraulics for pipelines. Pt I. C. B. Lester. *Pipe Line News*, June 1954, **26** (6), 21–4.—An introduction to the series and a discussion of units and systems of weights and mass. B. A. F.

1864. Hydrostatic testing of large gas pipelines. J. S. Powell and N. K. Senatoroff. *Oil Gas J.*, 23.8.54, **53** (16), 132.—Hydrostatic testing allows test to be carried out with less danger than with gas or air; the complete line can also be tested more fully, and blow-out danger is lessened.

If adequately dehydrated gas is used for line pressuring and care is taken to remove test water, there is little chance of serious hydrate formation. Hydrostatic tests should be planned before line construction.

The hydrostatic test should not be applied to a pipeline with a ground temp below 32° F. G. A. C.

1865. Where's that pig? W. H. Stewart. *Oil Gas J.*, 16.8.54, **53** (15), 122.—A magnetic scraper locator is described, as used by Sun Pipe Line Co, to quickly and accurately locate a stuck scraper. The instrument is portable, and consists of a detector probe, electronic amplifying circuit, indicating meter, earphones, and battery power supply. G. A. C.

1866. A nomogram for friction loss in pipes. R. G. Borthwick. *Roy. Engrs J.*, 1954, **68**, 248–56.—A nomogram is developed for the quick determination of friction losses in new steel or wrought iron pipe for military fuels—avgas, MT gas, avtag, avtur, and dieso. Scaled lines on the nomogram are for the fluid factor, pipe dia, flow in g.p.m. or brl/hr, and pressure loss in p.s.i. per ft in mile. A second nomogram for steam or air is given. G. S.

1867. Making test connections on buried pipe by the "Al Stegner" or "Harpoon" method. E. Sterrett. *Pipe Line News*, June 1954, **26** (6), 44–50.—A hole, wide enough to take a 3-inch dia aluminium casing, is drilled by hand, using an earth auger, down to the previously located pipeline. The milling tool, consisting of a light frame having a hand driven cutter at its base, is lowered down the casing and clears the pipe wrapping and enamel from the pipe, giving a clean surface to which the test lead can be attached. The lead is attached by means of a cartridge of Thermit compound which generates sufficient heat to weld or braze the copper-lead wire to the pipe. Ignition is caused by heating a piece of nichrome wire, buried in the cartridge, by means of a 6-volt battery. The cartridge may be sealed in cellophane or plastic, and used under water if necessary. The method gives a saving of between 85 and 95% of the man hours required for the old bell-hole method. B. A. F.

1868. Stray currents from cathodic protection installations. C. A. Erickson. *Pipe Line News*, May 1954, **26** (5), 39–45.—Indiscriminate use of DC current for cathodic protection of line can lead to serious corrosion of surrounding lines and structures. Methods of detecting stray currents are by pipe-to-soil potential measurements and by measuring the magnitude and direction of the DC current on the line. Points of interference are easily seen by plotting these measurements against position along line. Damage to neighbouring structures can be eliminated by means of "drainage" wires which give a set current drainage at the point of interference or restore the original soil potential. Location of the ground beds needs special care, and should be as far as possible from existing wells and lines which are poor conductors. Co-operation with other line owners in the area is the best method of protection against stray current corrosion. B. A. F.

1869. Twin 5800 foot oil lines laid across Delaware river. Anon. *Pipe Line News*, May 1954, **26** (5), 32–4.—The trench was dredged from New Jersey side, 2000 ft over mud flats and thence below a deep water anchorage to the Pennsylvanian side of the river. The elevation of the trench varied from 18 to 60 ft below mean water level. The lines, one 8 inch, the other 12 inch dia, were coated with $\frac{1}{8}$-inch Somastic coating and $1\frac{1}{4}$-inch Hevicote concrete and were welded up into 2 2900 lengths. These were then pigged and tested hydrostatically to 1200 p.s.i. The lines were launched simultaneously from a 3000-ft railway track laid on the New Jersey side. Pontoons lashed to the pipe gave a negative buoyancy ranging from 20 to 60 lb. The pipes were pulled by 2 50-ton and one 80-ton winches, the nose section being held up by a double drum winch mounted on 2 steel barges. After 2000 ft had been pulled, the nose stuck in the mud and the cable broke. The number of pontoons was double over this section and the pull successfully completed. A minimum of 15 ft of back fill was used in the deep water trench. B. A. F.

1870. Study of Sagot line break reveals valuable river crossing data. Anon. *Pipe Line News*, June 1954, **26** (6), 25–6.—The 12-inch line across the Magdalena river failed after 15 years service due to crystallization of the steel. Fracture occurred through the centre of an iron river weight, and the section of pipe had been subjected to reversal stresses before breaking. Repair was effected by cutting off a short section on either side of the break, bevelling the edges, and putting in a standard weld. An unsupported section of pipe in the affected area was eliminated by dredging a trench that allowed complete burial of the pipe. A short section of pipe was added at the shore end header to allow for the added length required due to burying the line and removing test pieces. B. A. F.

1871. Gold Coast sea-discharge line for oil. Anon. *Fluid Handl.*, 1954, 55, 207–10.—Details of the method of installation of the $2\frac{1}{2}$ miles of submerged pipeline are described. D. M.

1872. The construction of a pipeline bridge and oil terminal in the coastal swamps of New Guinea. J. P. A. van Lookeren Campagne. *Ingenieur, 's Grav.*, 6.8.54, **66** (32), B.131–40.—The bridge has been constructed of pre-stressed concrete piles and galvanized steel bracings. It carries over a distance of 10 miles a single 24-inch pipeline through which the crude from the Wasian and Mogoi fields is gravitated to the terminal. The latter consists of a steel platform carrying the manifold and hose-handling equipment, and is protected by 4 flexible steel dolphins. The material was shipped from Rotterdam and assembled on site. Total cost was approx £640,000, and completion took 16 months. 18 constructional drawings, diagrams, and photographs are included. G. F. T. C.

1873. Maintenence and operation of storage tanks and associated equipment. E. E. Mincheff. *Pipe Line News*, June 1954, **26** (6), 27–33.—A major source of product loss in floating roof tanks is through poor maintenance of fabric seals and poor fit between shoe and shell. In hot summer weather vapour leak from the rim of a 40,000-brl tank may reach 10 cu. ft/minute. Spring- and weight-loaded hanger bars should be examined periodically for free movement and adjusted to give good shell contact. Severe winter conditions may cause sticking of old style floating roofs due to uneven snow loads on the roof deck. This gives rise to gauging inaccuracies. Freezing-up of deck drains can be prevented by sealing off syphon type drains or by filling drain line with anti-freeze soln. Inverted-cone tank bottoms have been designed so that water settling out in the tank may be pumped off at the max rate, giving an additional tank working capacity of $2\frac{1}{2}$–$7\frac{1}{2}$%. Poor tank foundations can prevent floating roof from moving freely giving erratic gauging conditions. Where soil instability is a cause, a cement grout can be injected to level and stabilize the foundation. The vapour expansion system of storage is easy to operate, and gives lower maintenance costs. The investment is less than for equivalent floating roof tanks. Vapour storage space should not be less than $7\frac{1}{2}$% of the interconnected tank storage space. Vapour piping should be sized for a maximum rate of flow of 15% expansion of vapour space in 6 hr with an allowance for filling rate. Leaky vacuum and pressure vent valves are source of largest vapour loss, and the correct sizing of these valves to prevent stressing of tanks is important. Tank bottoms may be protected against corrosion by a cathodic protection method using a rectifier, a 120,000-brl tank requiring 100 watts. B. A. F.

1874. Aluminium roofing in severe conditions of service. Anon. *Petrol. Times*, 17.9.54, **58** (1490), 959.—Some case histories are given on the use of aluminium in the petroleum industry, and applications outlined. Results confirm that the durability of aluminium makes it a highly economical material for roofing and constructional purposes, the resistance to atm corrosion being due to the very hard adherent film of oxide that forms on the surface of the exposed metal. G. A. C.

1875. Underground LPG storage. E. H. Counts and C. L. Childress. *Oil Gas J.*, 30.8.54, **53** (17), 73.—Sinclair Oil and Gas Co are in process of completing a 5,000,000-gal hard-rock underground storage for LPG nr Seminole, Okla. Propane for storage will come from the company's plant. 2 4 × 7-inch centrifugal pumps will remove propane from storage through a dehydrator. G. A. C.

1876. Products go underground. G. H. Billue. *Petrol. Refin.*, 1954, **33** (7), 108–10.—The cost of storing LPG underground is less than 35% of conventional storage costs. This

makes storage of LPG to meet fluctuating demands economically possible. A list of underground storage projects in the U.S.A. indicates an ultimate planned capacity of 14 million brl. R. D. S.

1877. Washed out salt beds. J. N. Haight and F. G. Bernard. *Petrol. Refin.*, 1954, **33** (7), 111–13.—A description of the preparation of underground high pressure storage for 63 million gal of LPG at Midkiff, Texas. Salt is washed out from an 800-ft thick bed, 1550 ft below the surface, and the saturated brine stored in a layer of brackish water sand for use in displacing the products from storage as required. R. D. S.

1878. Excavated caverns. J. W. Nixon. *Petrol. Refin.*, 1954, **33** (7), 114–16.—An outline of the methods used at Tuscola, Illinois, in excavating storage caverns from limestone rock for the underground storage of 170,000 brl of propane. R. D. S.

1879. Mixers for large tank blending. J. H. Rushton. *Petrol. Refin.*, 1954, **33** (8), 101–7.—An analysis of the theory and techniques of large tank blending. Streams produced by propellers entrain and mix liq as effectively as, or more effectively than, streams from nozzles. Allowing for pressure drop in the circulation pipes, side entering propeller mixers produce equivalent flow in tanks for less energy than is required for external recirculation pumps. R. D. S.

1880. Why prestressed concrete in the refinery? J. S. Bell and D. R. de Veaux. *Petrol. Refin.*, 1954, **33** (7), 123–6.—A discussion of the properties of prestressed concrete and its use in tank construction. Comparison with steel storage tanks favours concrete on the grounds of overall cost, steel requirements, and evaporation losses, but for versatility, ease of construction, and repair, steel tanks are better. R. D. S.

1881. Do you need more horsepower? O. H. Moore. *Pipe Line News*, July 1954, **26** (7), 25–30.—The high cost of installing new compressor equipment makes the modification of old equipment desirable. By fitting high compression cyl heads a 2-cycle gas engine had its compression of 130–160 p.s.i. raised to 200–260 p.s.i. Experimental work indicates that an extra 7% power can be obtained by utilizing the heat of compression of the scavenger air. Also, injection of a water spray into the scavenger air reduced the temp from 145° to 115° F and detonation, due to overloading of engine, was eliminated. Turbo-charging, using exhaust-driven centrifugal compressors, increases the available engine h.p. and presents no starting-up difficulties. Experiments on one turbo-charged engine indicated that the greatest fuel economy was reached at 130–140% of rated h.p. By careful planning and use of multi-building compressor stations, unnecessary pressure drop losses in gas, oil, and cooling water lines, etc., can be avoided. Knowing the percentage flow through each compressor building, the pressure drop in the gas lines can be calculated and the optimum distribution of flow between buildings achieved. B. A. F.

1822. Alleviation of cooling water problems—use of sulphur burning equipment. J. T. Russell. *Pipe Line News*, Aug. 1954, **26** (8), 25–31.—Remote natural gas compressor stations have extensively used zeolite treatment of cooling water, resulting in a deterioration of the cooling-tower wood. Neutralization of alkaline, zeolite-treated water is most economically performed using a sulphur burner, the sulphites formed being oxidized to more soluble sulphates by dissolved oxygen. Details of plant to treat 25,000–70,000 gal/day of make-up water are given. pH maintained at 6, which prevented scale formation and deterioration of wood. It also appeared to inhibit the growth of slime and algæ. Cost of treatment was between 25 and 50% of conventional 2-chemical treatment. B. A. F.

1883. Patents. U.S.P. 2,671,012 (6.4.50; 2.3.54). C. D. Perry. Device for conserving gaseous hydrocarbons from gasoline storage tanks.

U.S.P. 2,672,254 (4.8.45; 16.3.54). H. C. Boardman, assr to Chicago Bridge and Iron Co. Storage vessel for liq comprising a vertical series of intersecting spherical shells with diaphragms located at the intersections. J. M. S.

U.S.P. 2,677,276 (26.7.48; 4.5.54). E. X. Schmidt, assr to Cutler-Hamer Inc. Liq level and temp indicating apparatus.

U.S.P. 2,77,939 (19.11.51; 11.5.54). H. H. Clute. Liquefied gas container.

U.S.P. 2,678,060 (8.10.47; 11.5.54). C. Arne, assr to Chicago Bridge and Iron Co. A gauge float including a member to be supported at a constant elevation relative to the surface of a stored liq.

U.S.P. 2,678,658 (2.11.50; 18.5.54). H. E. Rittenhouse, assr to Bowser Inc, and to Tokheim Corpn. Tank filling apparatus.

U.S.P. 2,678,752 (20.6.51; 18.5.54). E. A. West. Oil dispensing apparatus. D. A. R.

REFINERY OPERATIONS

REFINERIES AND AUXILIARY REFINERY PLANT

1884. Conoco enlarges Lake Charles plant. Anon. *Petrol. Refin.*, 1954, **33** (8), 119–22.—This refinery has been quadrupled in crude capacity to handle 45,000 b.d., and now produces special products such as dodecene, benzene, and toluene. Construction of a nearby gas processing plant will increase the volume of field condensables to be processed in the refinery. R. D. S.

1885. Shortcut to heat exchanger design—VII. C. H. Gilmour. *Chem. Engng*, 1954, **61** (8), 199–206.—This seventh article deals with the design of reboilers. Basis for the consideration of nucleate boiling is an expression developed by the author which satisfactorily correlates single tube experimental data and successfully produces designs for commercial-sized vaporizing equipment. D. M.

1886. Fouling of heat exchangers. D. L. Katz, J. G. Knudsen, G. Balekjian, and S. S. Grover. *Petrol. Refin.*, 1954, **33** (8), 123–5.—Tests reported here indicate that the fouling of finned tubes is likely to be similar to that of plain tubes with comparable percentages of reduction in performance. The cleaning of both bundles with a kerosine–water–detergent emulsion restored the heat transfer to essentially its initial condition. R. D. S.

1887. Increase heat transfer coefficients by vapour agitation. L. Gomez and J. E. Meyers. *Petrol. Refin.*, 1954, **33** (7), 117–19.—Experiments reported here show that the injection of air under the tubes in a heat exchanger may increase the outside film coeff tenfold. Continuous operation is probably uneconomical, but for short-term high heat loads air agitation provides an easy method of increasing the heat transfer rate. R. D. S.

1888. Producing and distributing ethylene. P. W. Cornell, W. H. Litchfield, and H. M. Vaughan. *Petrol. Refin.*, 1954, **33** (7), 135–40.—A discussion of some of the typical operating problems encountered with large-scale ethylene plants, and with the delivery of the product by pipeline. The particular unit considered is at the Port Arthur, Texas, refinery of Gulf Oil Corpn, where the gas is produced by thermally cracking refinery gases in a tubular pipe heater and the purified gas piped to a number of surrounding chemical plants. R. D. S.

1889. Treating spent refinery caustic. F. J. Hendel and H. C. Day. *Petrol. Refin.*, 1954, **33** (7), 165–8.—The process described here disposes of waste caustic liquors and also produces valuable chemical by-products. The steps required are: (1) partial neutralization with hot waste flue gas; (2) acidification to separate the phenols; and (3) spray drying the remaining aq soln. The products are crude petroleum cresylic acids, sodium sulphate, and sodium carbonate. The process is continuous, and is claimed to overcome the difficulties encountered in earlier flue gas neutralization processes. R. D. S.

1890. Recent developments in two phase contacting devices. D. C. Freshwater. *Industr. Chem. Mfr*, 1953, **29**, 451–6.—Operations of absorption, dist, and extraction all involve transfer of mass by diffusion. Same theory applies and similar equipment is used. Standard bubblecap plate performance in dist columns can be improved under certain conditions by following plates: Koch Kaskade, Koch Benturi (= bent venturi), Shell Turbogrid, Kittel, Eld, also grid packing in place of normal column packing. Description of above, with limited performance data, is given. Improvements described in liq–liq extraction equipment, viz. jet perforated plates and rotating disk columns. A. C.

1891. Pollution control. A. P. Dennis, W. L. Pursell, T. W. Ferguson, R. F. Weston, and R. G. Merman. *Oil Gas J.*, 16.8.54, **53** (15), 110.—3 papers are presented dealing with pollution control at refineries, and include organization of an overall waste stream survey, removal of oil and sludge from waste water, and reduction of biological oxygen demand and control of effluent pH. The waste stream survey was conducted by the Bayway refinery of Esso Standard Oil Co and shows that an overall evaluation of a total waste effluent and its major component flows is the most practical method of determining effects of contamination sources. Tables give analytical procedures and sampling schedule.

Oil and sludge removal at Skelly's El Dorado plant is accomplished in a 15,000-g.p.m. oil–water separator with 6 parallel single-stage chambers. Sludge pits fitted with drain and overflow pipes, and 5 pumps are part of the equipment. At the Philadelphia plant of Atlantic Refining Co a 10,000-gal/day chemical flocculation waste treatment unit reduces effluent oil content below 30 p.p.m. and reduces organic pollution so that a minimum dissolved oxygen content of 2 p.p.m. is achieved in the Schuylfall river. At the same time effluent pH is controlled to a minimum of 6·0. J. A. C.

1892. Scale models. H. J. Bowen. *Chem. Engng*, 1954, **61** (8), 176–82.—For design, construction, and training, scale models of chemical plants are proving to be valuable time and money savers. This article describes the correct way to use them. D. M.

1893. Patents. U.S.P. 2,670,848 (Netherlands 11.5.50; 2.3.54). H. T. van Houten, L. J. P. Smulders, and J. H. van Zeeland, assrs to Shell Development Co. Floating self-adjusting liq skimmer.

U.S.P. 2,671,050 (31.3.50; 2.3.54). F. J. Shortsleeve and M. E. Nicholson, assrs to Standard Oil Co. Furnace tubes for heating hydrocarbons are made of an austenitic type stainless steel comprising 1–3% silicon, between 7·5 + 2·5a% silicon and *ca* 20% nickel, *ca* 17·5% chromium and the rest iron and being free from sigma phase after prolonged heating at 900°–1700° F.

U.S.P. 2,671,053 (20.6.47; 2.3.54). H. Dannenberg, assr to Shell Development Co. High vacuum fractional dist column.

U.S.P. 2,671,122 (13.6.49; 2.3.54). W. A. Goldtrop, assr to Phillips Petroleum Co. Multi-reactor pebble heater apparatus.

U.S.P. 2,671,741 (23.2.50; 9.3.54). W. J. Duvall, assr to Texas Co. Cleaning tubular heaters containing coke and salts deposited from hydrocarbon oils heated therein, by charging water to the heater, heating the external tube surfaces to vaporize the water, and finally passing air through the tubes at a temp sufficient to burn out the coke.

U.S.P. 2,672,191 (27.1.51; 16.3.54). O. F. Campbell and W. H. Decker, assrs to Sinclair Refining Co. Improved air–gas nozzle assembly for multiple nozzle, directional flame control, oil and gas fired burners for cyl vertical tube radiant type oil refinery heaters.

U.S.P. 2,673,786 (17.10.49; 30.3.54). C. E. Alleman, assr to Phillips Petroleum Co. Apparatus for converting and quenching hydrocarbons involving a pebble heater and a pebble quencher.

U.S.P. 2,673,791 (2.1.51; 30.3.54). R. L. McIntire, assr to Phillips Petroleum Co. Pebble heat exchanger. J. M. S.

U.S.P. 2,678,812 (19.10.41; 18.5.54). A. S. Richardson, assr to Phillips Petroleum Co. Pebble heater apparatus.

U.S.P. 2,679,507 (15.11.52; 25.5.54). K. L. Shull, D. C. Robertson, and R. E. Knowlton, assrs to Standard Oil Co. Disposal of spent refinery caustic waste.

U.S.P. 2,679,536 (15.11.52; 25.5.54). R. E. Knowlton, assr to Standard Oil Co. A process of treating spent caustic refinery waste liquors comprising sulphur compounds and cresylic acids. D. A. R.

Ger.P. 913,782, 13.5.54. — Brünnert, assr to Farbwerke Hoechst AG, formerly Meister, Lucius & Brüning, Frankfurt (M.)-Hoechst. Process and column for material change and heat exchange. (Addn. to Pat. 908,028.)

Ger.P. 914,372, 20.5.54. Lurgi Ges. für Wärmetech. m.b.H., Frankfurt (M.). Compound electrofilter.
BrennstChemie, 1954, **35** (11–12). R. T.

DISTILLATION

1894. Binary distillation. A. J. Teller. *Chem. Engng*, 1954, **61** (9), 168–88.—Beginning with familiar fundamentals of 2-component separations, this report shows how to apply the more advanced principles and techniques. D. M.

1895. Patents. U.S.P. 2,671,324 (26.1.49; 9.3.54). P. R. Trumpler, assr to M. W. Kellogg Co. Fractionation of gaseous mixture containing relatively high-boiling impurity by compressing, expanding, liquefying, and evaporating at least part of the mixture.

U.S.P. 2,672,034 (26.10.50; 16.3.54). M. R. Morrow, assr to Standard Oil Development Co. Dehydration of liquefied petroleum gas by rectification to obtain a bottoms fraction free from water and a overhead fraction (A) comprising water and hydrocarbons, condensing A and separating water therefrom, flashing the condensate to obtain a gaseous and liq phase and recovering a dehydrated hydrocarbon from the liq phase.

U.S.P. 2,673,177 (24.10.49; 23.3.54). C. K. Buell, assr to Phillips Petroleum Co. Process for dist of shale oil from oil shale.

U.S.P. 2,673,456 (16.6.49; 30.3.54). W. G. Scharmann, assr to Standard Oil Development Co. Separating low boiling gas mixtures by liquefaction and fractionation.

U.S.P. 2,673,829 (22.5.50; 30.3.54). R. A. King, assr to Union Oil Co of California. Crude petroleum is introduced into a preconditioning zone in which natural gas and natural gasoline are separated at a low pressure by means of a low mol. wt. stripping gas forming a recycle gas of higher mol. wt. and a preconditioned crude petroleum (I). I is countercurrently contacted in an absorption zone with a wet natural gas at a high pressure forming a rich crude petroleum (II) and a dry gas. II is passed through a fractionation zone (III) countercurrently to vapours rich in natural gasoline at an intermediate pressure forming a stabilized crude petroleum (IV) and a desorbed gas. Vapours rich in natural gasoline are separated from IV and returned to III. J. M. S.

Ger.P. 912,932, 22.4.54. — Schmidt, assr to Fa. Still, Recklinghausen. Process and plant for operating dist retorts for high-b.p. materials in inert gas flow.

Ger.P. 912,845, 22.4.54. — Schmidt, Wiesbaden. Method for processing solid paraffins from Fischer–Tropsch hydrocarbon synthesis from CO and H_2. (Addn. to Pat. 909,387.)

Ger.P. 914,004, 13.5.54. — Turowski and — Buffleb, assrs to Rütgerswerk AG, Frankfurt (M.). Process for obtaining anthracene from tech anthracene fractions.

Ger.P. 913,807, 13.5.54. — Kiehn, assr to Union Rheinische Braunkohlen Kraftstoff AG, Wesseling. Process for dist corrosive products.

BrennstChemie, 1954, 35 (11–12). R. T.

ABSORPTION AND ADSORPTION

1896. Patents. U.S.P. 2,670,810 (21.1.52; 2.3.54). W. S. Dorsey, assr to Union Oil Co of California. Acetylene is recovered from gas containing acetylene and ethylene by scrubbing the gas with N-formyl- or -acetyl-pyrrolidine or piperidine.

U.S.P. 2,671,791 (9.5.50; 9.3.54). R. B. Egbert, assr to Chempatents Inc. Feed gas for the oxidn of ethylene (A) is prepared from gaseous streams containing H_2, A, and other hydrocarbons by selectively absorbing A from the stream with a solvent and passing a stream of air in the ratio of 7–12 mol of air to one mol of A countercurrent to the enriched solvent to strip A and form an A–oxygen reaction mixture containing 4½–13% A.

U.S.P. 2,673,176 (20.12.48; 23.3.54). W. B. Whitney, assr to Phillips Petroleum Co. Method of separating paraffinic and aromatic components of a lub oil stock (A) which comprises mixing a paraffinic hydrocarbon diluent and silica gel to form a slurry (B), mixing a paraffinic hydrocarbon diluent, silica gel, and A to form a second slurry (C), forming B and C into thin layers, C being superimposed on B, moving the layers through a zone in which paraffinic hydrocarbon diluent is sprayed on the upper layer and then through a zone in which an aromatic desorbent is sprayed on the upper layer. J. M. S.

Ger.P. 912,690, 22.4.54. — Wehrheim, — Becker, and — Kronacher, assrs to Dr C. Otto & Comp. G.m.b.H., Bochum. Process for recovering HCN and NH_3 separately from gases and vapours.

Ger.P. 914,005, 13.5.54. — Bratzler and — Engelhardt, assrs to Labor. für Adsorptionstech. G.m.b.H., Bad Homburg (v.d. Höhe). Process for adsorbing separately low-b.p. hydrocarbons from mixtures with higher-b.p. constituents.

Ger.P. 914,125, 20.5.54. — Vollmer, assr to Metallges. AG, Frankfurt (M.). Process for adsorbing materials from gases.

Ger.P. 914,175, 20.5.54. — Breitbach, — Schmidt, and — Schneider, assrs to Still, Recklinghausen. Process for separating and recovering tar, NH_3, and H_2S from dry dist gases.

BrennstChemie, 1954, **35** (11–12). R. T.

SOLVENT EXTRACTION AND DEWAXING

1897. Patents. U.S.P. 2,671,046 (21.6.51; 2.3.54). R. C. Arnold and A. P. Lien, assrs to Standard Oil Co. Refining hydrocarbon oils by extracting with an aromatic compound-liq SO_2 solvent containing a promoter which is BF_3, $AlCl_3$, $FeCl_3$, $TiCl_4$, $HgCl_2$, BCl_3, or $ZnCl_2$ and extracting the raffinate obtained with liq SO_2 in the absence of any promoter.

U.S.P. 2,671,047 (29.9.51; 2.3.54). R. C. Arnold and A. P. Lien, assrs to Standard Oil Co. Solvent extraction with liq SO_2 containing BF_3.

U.S.P. 2,672,406 (18.11.48; 16.3.54). S. C. Carney, assr to Phillips Petroleum Co. Apparatus for contacting liq comprising a cyl casing, a shaft, a centrifugal impeller mounted on the shaft, a transverse partition plate extending from the casing to the shaft at each end of the impeller, and a cyl metal shell within the casing and concentric therewith, having a perforated portion disposed circumferentially to the impeller. The lighter liq enters through this perforated portion, and the heavier liq enters through a perforated sleeve on the shaft.

U.S.P. 2,673,174 (23.5.51; 23.3.54). E. P. King, assr to Pure Oil Co. In the solvent extraction of lub oils with a phenol solvent, ammonia, or an ammoniacal compound which decomposes under the extraction conditions to liberate ammonia, is maintained in the contacting zone in order to improve phase separation.

U.S.P. 2,673,830 (23.6.50; 30.3.54). R. C. Arnold, assr to Standard Oil Co. High sulphur virgin petroleum dist boiling between 325° and 575° F are refined by contacting at +20° to −40° C with liq SO_2 containing SO_3. J. M. S.

Ger.P. 913,571, 6.5.54. — Still, Recklinghausen (Westf.). Process and plant for joint countercurrent scrubbing of benzene and naphthalene from gases.

Ger.P. 913,461, 6.5.54. — Still, Recklinghausen (Westf.). Process for scrubbing phenol from dry dist gases of solid fuels.

BrennstChemie, 1954, 35 (11–12). R. T.

CRACKING

1898. Conversion processes in the petroleum refining industry. E. S. Sellers. *Industr. Chem. Mfr*, 1953, **29**, 387–93.—Conditions under which low O.N. hydrocarbons may be converted to high O.N. may be estimated from thermodynamic data, with indication of likely yields, but no indication of rate of reaction. Thermal reforming at 750–1200 p.s.i. and 1000°–1100° F is practised on light S.R. naphtha. Typical feed of 40 O.N. containing 83% paraffins and trace aromatics is converted to 70 O.N. containing 48% paraffins and 23% aromatics, with 81% yield. Reaction time at 1000° F for once-through operations is usually about 300 sec. Fluid cat cracking supersedes thermal cracking on account of higher O.N. of gasoline (82 ASTM), more C_3–C_4 unsaturated gases, and less heavy fuel oil. Reaction time about 5 sec at 450°–500° C and 10 p.s.i. Cat contains up to 1·3% carbon before regeneration. In largest plants up to 50 tons cat circulating per minute. Polymerization of unsaturated C_3–C_4 fraction over phosphoric acid cat produces up to 95 O.N. gasoline blending stock, with 90% conversion. A. C.

1899. Catalytic process mechanics. M. Sittig. *Petrol. Process.*, 1954, **9** (7), 1048–55.—Some of the mechanical devices available to the engineer who is interested in the conduct of cat processes are reviewed. Ingenuity has already been reflected in the development of cat processes to date, and the versatility of both moving- and fluidized-bed techniques presents a challenge for future development. J. W. H.

1900. New hydroformer is 15–20% cheaper. Anon. *Chem. Engng*, 1954, **61** (8), 116–18.—Circulating inert solids with cat adds a new heat source to fluid hydroformers. This lowers gas recycle rates and permits much smaller reactor dia. D. M.

1901. Ethylene's big business with Gulf. P. W. Cornell, W. H. Litchfield, and H. M. Vaughan. *Oil Gas J.*, 16.8.54, **53** (15), 125.—Critical operating problems met with in ethylene production at the Port Arthur, Texas, refinery of Gulf Oil Corpn are dealt with. Water removal is shown to be critical, and cascade refrigeration is required for the demethanization step. Precautions taken to minimize coking in the ethylene formation are discussed. G. A. C.

1902. Patents. U.S.P. 2,671,057 (5.8.49; 2.3.54). W. L. McClure, assr to Sun Oil Co. Method of regenerating hydrocarbon oil conversion cat.

U.S.P. 2,671,763 (29.12.50; 9.3.54). L. O. Winstrom and W. B. Harris, assrs to Allied Chemical and Dye Corpn. Nickel sulphide–alumina cat are regenerated by treatment with an oxygen-containing gas at 300°–700° C and then with a hydrogen-containing gas at 200°–700° C.

U.S.P. 2,671,796 (18.12.48; 9.3.54). P. W. Garbo, assr to Hydrocarbon Research Inc. Process for contacting gaseous reactant and finely divided solid particles.

U.S.P. 2,672,407 (26.2.49; 16.3.54). F. W. Leffer, assr to Universal Oil Products Co. Apparatus for contacting subdivided solid particles with different fluid streams within separate superimposed contacting zones.

U.S.P. 2,672,452-3 (17.11.52; 16.3.54). C. Wankat, assr to Universal Oil Products Co. Forming spherical particles of inorganic oxides by converting a sol of the oxide to a hydrogel in a hydrocarbon oil medium. An aromatic hydroxy compound or a condensation product of an *o*-hydroxyaromatic aldehyde with an alkylenepolyamine is added to the oil.

U.S.P. 2,672,489 (10.7.48; 16.3.54). W. W. Holland, assr to Gyro Process Co. Saturated hydrocarbons are thermally converted to olefins and the products fractionated to yield gaseous hydrocarbons (A) and liq hydrocarbons. A low boiling liq aromatic fraction (B) is separated from A, and the residual gaseous hydrocarbons are compressed and passed to an absorber up which they flow countercurrent to a stream of B. *iso*Butylene and butadiene are recovered from the absorbent and ethylene from the gases issuing from the absorber.

U.S.P. 2,673,187 (7.6.51; 23.3.54). H. M. Stine, assr to Standard Oil Co. Iron-poisoned silica–alumina cracking cat is regenerated by adding beryllia.

U.S.P. 2,673,188 (3.12.51; 23.3.54). R. E. Schexnailder, assr to Standard Oil Development Co. Cat are prepared by hydrolysing an anhyd aluminium alcoholate soln with a silica hydrogel and removing water from the mixture.

U.S.P. 2,673,831 (13.6.50; 30.3.54). E. C. Hughes, assr to Standard Oil Co. Wax slops having a boiling range of 600°–1100° F, a visc of 50–150 SUS at 100° F, and up to 12% wax at 70° F are blended with liq butane under conditions to form a homogeneous soln which is cooled to 50°–80° F to precipitate wax. The wax is separated, the butane removed, and the dewaxed slops are cracked.

U.S.P. 2,673,832 (1.11.49; 30.3.54). R. C. Lassiat, assr to Sun Oil Co. Apparatus for transporting subdivided solids from a lower to a higher zone. J. M. S.

Ger.P. 913,647, 6.5.54. — Perlich, assr to Ges. für Linde's Eismaschinen AG, Höllriegelskreuth. Process and plant for cat conversion and, contingently, measurement of small quantities of components in gas mixtures.

Ger.P. 913,680, 6.5.54. — Michael and — Göhre, assrs to BASF AG, Ludwigshafen (Rhein). Process for cat cracking of hydrocarbons. (Addn. to Pat. 739,510.)

Ger.P. 914,131, 20.5.45. — Scholz, assr to Metallges. AG, Frankfurt (M.). Contact furnaces.
BrennstChemie, 1954, **35** (11–12). R. T.

HYDROGENATION

1903. Unifining upgrades distillate fuels. J. G. Eckhome, C. F. Gerald, and A. J. de Rosset. *Oil Gas J.*, 30.8.54, **53** (17), 81.—Further information is presented on upgrading of middle dist by Unifining. Over 90% of sulphur present is removed, colour stability of cycle oils and thermal dist are improved, and gasoline yields increased by the process. Tables show desulphurization of straight-run diesel oils by Unifining and characteristics of Unifining of cracked middle dist. G. A. C.

1904. Patents. U.S.P. 2,673,886 (18.7.51; 30.3.54). T. R. Steadman, assr to B. F. Goodrich Co. Raney nickel for use as a hydrogenation cat is stored under water containing a wetting agent. J. M. S.

Ger.P. 914,373, 20.5.54. — Kölbel and — Langheim, assrs to Rheinpreussen AG für Bergbau und Chemie, Homberg (Ndrh.). Process for taking Fe cat into operation for CO hydrogenation.
BrennstChemie, 1954, **35** (11–12). R. T.

POLYMERIZATION

1905. Patents. U.S.P. 2,671,073 (30.9.50; 2.3.54). L. M. Welch, J. F. Nelson and H. L. Wilson, assrs to Standard Oil Development Co. Copolymerization of *iso*butylene and a conjugated multi-olefin at 40° to −164° C in the presence of a Friedel–Crafts cat, a solvent, an alkyl halide, and 0·1–0·8% of a diolefin of the formula

$$H_2C{:}C(CH_3){\cdot}(CH_2)_x{\cdot}C(CH_3){:}CH_2$$

where x is from 1 to 6.

U.S.P. 2,671,774 (28.7.52; 9.3.54). E. A. MacCracken and H. L. Chaney, assrs to Standard Oil Development Co. Rubbery polymers are made by polymerizing an *iso*-olefin of 4 or 5 carbons atom (A), a conjugated diolefin of 4–8 carbon atoms, and a divinyl aromatic hydrocarbon (B) at a temp below −40° C with a Friedel–Crafts cat dissolved in a solvent, the proportion of B being 4–10 wt % of A. J. M. S.

Ger.P. 914,128, 20.5.54. — Tramm, — Schailer, and — Goethel, assrs to Ruhrchemie AG, Oberhausen (Rhld.). Method for producing higher-mol hydrocarbons.

Ger.P. 914,374, 20.5.54. — Kölbel and — Ackermann, assrs to Rheinpreussen AG für Bergbau und Chemie, Homberg (Ndrh.). Process for converting saturated chain or cyclic hydrocarbons into higher-mol paraffin to waxy hydrocarbons or their O_2 compounds.
BrennstChemie, 1954, **35** (11–12). R. T.

ALKYLATION

1906. Patents. U.S.P. 2,671,117 (11.2.50; 2.3.54). H. D. Kluge and F. W. Moore, assrs to Texas Co. Phenols are alkylated with a propylene polymer containing 18–26 carbon atoms in the presence of $AlCl_3{\cdot}HSO_4$ cat at 60°–100° C.

U.S.P. 2,671,121 (23.12.49; 2.3.54). F. W. Banes and W. P. FitzGerald, assrs to Standard Oil Development Co. 2-Alkyl-1-alkenes are made by reacting a monoalkyl methyl carbinol with ethylene in the presence of di-*tert*-butyl peroxide or hydroperoxide at 100°–250° C and a pressure of 250–1500 p.s.i.g. to produce a mixture of 2-alkyl-2-alkanols and dehydrating the alkanols.

U.S.P. 2,671,815 (21.6.50; 9.3.54). H. Pines and V. N. Ipatieff, assrs to Universal Oil Products Co. Unsymmetrical diarylalkanes are made by reacting, in the presence of an acid-acting cat, an alkyl*cyclo*-olefin, an aromatic hydrocarbon having 2 saturated hydrocarbon substituents in *p*-position to each other, one of these substituents having only 1 or 2 hydrogen atoms on the carbon atom attached to the ring, and an aromatic hydrocarbon having not more than one saturated hydrocarbon substituent attached to the ring.

U.S.P. 2,673,224 (16.12.49; 23.3.54). R. M. Kennedy and A. Schneider, assrs to Sun Oil Co. Toluene is alkylated by reacting it with an *iso*paraffin at 40°–70° C and atm pressure in presence of a mixture of *tert*-butyl chloride and aluminium chloride. The *iso*paraffin has at least 5 carbon atoms and one tertiary hydrogen atom per mol.

U.S.P. 2,673,226 (29.6.50; 23.3.54). H. J. Hepp, assr to Phillips Petroleum Co. In an alkylation process employing aluminium chloride as cat, after separation of the cat the products are freed from combined chlorine by contacting with a liq aluminium chloride–hydrocarbon complex cat which

contains free aluminium chloride and has a heat of hydrolysis of 280–375 g cal/g. J. M. S.

Ger.P. 914,129, 20.5.54. — Kolling and — Rappen, assrs to Ruhrchemie AG, Oberhausen (Rhld.). Process and plant for producing highly-active contact oils for Friedel–Craft alkylations.

BrennstChemie, 1954, **35** (11–12). R. T.

ISOMERIZATION

1907. Patents. U.S.P. 2,671,120 (28.4.50; 2.3.54). V. N. Ipatieff, H. Pines, and B. Kvetinskas, assrs to Universal Oil Products Co. Alkylbenzenes are isomerized at 400°–525° C, a pressure of at least 3000 p.s.i., and an hourly liq space vel of 1·0–1·5. J. M. S.

U.S.P. 2,678,337 (15.4.52; 11.5.54). G. M. Good and G. Holzman, assrs to Shell Development Co. Cat isomerization of methyl substituted phenols. D. A. R.

CHEMICAL AND PHYSICAL REFINING

1908. Recycle process material balance from single pass data. O. L. Culberson. *Petrol. Refin.*, 1954, **33** (8), 127–30.— Data on the efficiency, yield, and conversion obtained from single pass lab experiments can readily be applied to processes with a recycle stream by means of the equations and graphs presented here. R. D. S.

1909. Patents. U.S.P. 2,671,048 (1.3.51; 2.3.54). R. H. Rosenwald, assr to Universal Oil Products Co. Sweetening sour dist by contacting them in the presence of air with a phenylenediamine sweetening agent and an aliphatic polyamine, heterocyclic nitrogen compound, or a quaternary ammonium compound.

U.S.P. 2,671,049 (30.6.51; 2.3.54). R. H. Brown, assr to Standard Oil Co. Mercaptans and cyclic sulphides are removed from petroleum oils by treating the oil to remove the mercaptans and then contacting it with a mercuric salt and separating the mercuric salt–cyclic sulphide complex formed from the oil.

U.S.P. 2,671,754 (21.7.51; 9.3.54). A. J. de Rosset and C. H. Watkins, assrs to Universal Oil Products Co. Hydrocarbon oil of high S content is contacted countercurrently with H_2 in the presence of a sulphur resistant cat in a first conversion zone (A) and passed to a second conversion zone (B), where it is contacted countercurrently with hydrogen, obtained by removing hydrocarbons and H_2S from the effluent gases from A, in the presence of a hydrogenation cat. The gases from B are passed in indirect heat exchange with the oil flowing from A to B and then fed into A as the H_2 stream.

U.S.P. 2,671,762 (24.3.51; 9.3.54). T. G. Wisherd, assr to Sinclair Refining Co. Water-in-oil emulsions are resolved by adding a material produced by the sulphonation and neutralization of the bottoms produced in the manufacture of dodecylbenzene.

U.S.P. 2,672,433 (G.B. 15.3.50; 16.3.54). F. W. B. Porter, R. T. Northcott, and J. Rowland, assrs to Anglo-Iranian Oil Co. Cat desulphurization of petroleum hydrocarbons using no extraneous hydrogen. A low boiling fraction is desulphurized in a first zone, and some of the hydrogen-rich gas produced in that zone is used to desulphurize a residual fraction in a second zone.

U.S.P. 2,672,457 (20.6.50; 16.3.54). J. A. Weedman, assr to Phillips Petroleum Co. Decomposition of adducts of urea and straight-chain paraffins using liq pentane.

U.S.P. 2,672,487 (28.5.49; 16.3.52). B. R. Tegge, C. S. Carlson, and J. Stewart, assrs to Standard Oil Development Co. Separating *p*-xylene from hydrocarbons boiling in the range 130°–160° C by crystallizing at −40° to −90° C.

U.S.P. 2,673,195 (25.6.48; 23.3.52). C. J. Busso and E. L. Walters, assrs to Shell Development Co. Urea separation of straight-chain hydrocarbons from hydrocarbon mixtures effected in the presence of a sodium salt of an alkylaryl sulphonic acid or of an alkylated sulphosuccinic acid or a high mol. wt. *sec*-alcohol.

U.S.P. 2,673,225 (29.4.51; 23.3.54). A. W. Francis, assr to Socony-Vacuum Oil Co. Olefins are separated from hydrocarbon mixtures by contacting with a mixture of silver nitrate (A) and a solvent for A, the solvent being present in an amount from 15 to 85% of that necessary to dissolve all of A. An olefin–A complex is formed which is separated and then dissociated. J. M. S.

U.S.P. 2,677,648 (17.11.51; 4.5.54). A. P. Lien and H. Shalit, assrs to Standard Oil Co. Desulphurization of light oils with hydrogen fluoride-activated alumina.

U.S.P. 2,677,649 (18.11.49; 4.5.54). I. Kirshenbaum and G. R. Gilbert, assrs to Standard Oil Development Co. A method of treating hydrocarbons boiling in the motor fuel range.

U.S.P. 2,677,666 (29.12.51; 4.5.54). P. F. Dougherty, assr to Sun Oil Co. Process for removing contaminants from crude oils.

U.S.P. 2,678,263 (4.8.50; 11.5.54). E. M. Glazier, assr to Gulf Research and Development Co. Production of aviation gasoline.

U.S.P. 2,678,305 (7.1.52; 11.5.54). J. F. Villarreal. The process for breaking an emulsion of oil and water which includes the step of bringing acetic acid in gaseous form into intimate contact with the emulsion.

U.S.P. 2,678,699 (18.2.52; 18.5.54). R. L. Fowler, assr to Superior Tank and Construction Co. Oil and gas separator.

U.S.P. 2,678,952 (31.3.51; 18.5.54). R. W. Krebs, assr to Standard Oil Development Co. Process for reducing sulphur content of OXO alcohols.

U.S.P. 678,954 (14.7.50; 18.5.54). J. P. O'Neil and J. M. Brooke, assrs to Phillips Petroleum Co. Removal of fluorine from hydrocarbon oils by treatment with boric oxide or boric acid.

U.S.P. 2,679,470 (12.2.52; 25.5.54). W. E. Kress, assr to Shell Development Co. Process and apparatus for continuously treating a fluid with an immiscible liq.

U.S.P. 2,679,471 (11.8.51; 25.5.54). G. W. Ayers and W. J. Sandner, assrs to Pure Oil Co. Process for refining hydrocarbon liq.

U.S.P. 2,679,472 (10.12.51; 25.5.54). J. W. Tooke, assr to Phillips Petroleum Co. Subjecting a narrow boiling range mixture comprising 2,2- and 2,4-dimethylpentanes and *cyclo*hexane to dist conditions in the presence of acetonitrile, recovering *cyclo*hexane from the kettle product, and recovering the dimethylpentanes from the overhead dist.

U.S.P. 2,679,484 (27.6.52; 25.5.54). M. de Groote, assr to Petrolite Corpn. Process for breaking petroleum emulsions.

U.S.P. 2,679,534 (20.11.50; 25.5.54). J. D. Koontz, assr to Standard Oil Development Co. Decobalting OXO aldehyde product in the presence of liq water.

U.S.P. 2,679,535 (19.2.52; 25.5.54). H. M. Lavender and J. R. B. Ellis, assrs to California Research Corpn. Purification of phenol. D. A. R.

Ger.P. 913,176, 29.4.54. — von Fragstein, assr to Farbenfabriken Bayer AG, Leverkusen Bayerwerk. Process for separating phenols from oils. (Addn. to Pat. 909,458.)

Ger.P. 913,889, 13.5.54. — Mäke, Raubling (Obb.). Process for recovering elementary S from waste gases and lean gas from roasting combined with heavy spar purification.

Ger.P. 913,808, 13.5.54. — Roelen and — Büchner, assrs to Ruhrchemie AG, Oberhausen (Rhld.)-Holten. Process for de-alcoholizing hydrocarbon–alcohol mixtures. *BrennstChemie*, 1954, **35** (11–12). R. T.

SPECIAL PROCESSES

1910. Fischer–Tropsch process and its potential applications. C. C. Hall. *Industr. Chem. Mfr*, 1953, **29** 400–4.—Recent technical advances in process discussed. Use of cat based on Fe instead of Co results in wider flexibility in operating conditions and nature of products, also allows variation in H_2 : CO ratio in feed gas within range 2 : 1 to 0·5 : 1. With Co cat products 98% hydrocarbons, but with Fe cat major part of products can be oxygenated, *e.g.* alcohols, or by operating at 220°–240° C, 50% wax obtained, including 30% hard wax of 90°–95° C m.p. Cost of products, assuming annual output 200,000–500,000 tons, in range £23–>£30/ton when starting from coal, and hence production of liq fuels in the U.K. by this process is uneconomic. Position is more attractive if process is operated for higher value chemicals as major product, and fuels as by-products. In other countries, *e.g.* S. Africa, where liq fuels based on petroleum are more expensive, Fischer–Tropsch process from coal can compete, and plant is now being erected. (*Cf.* Abs. **56**, 1954.) A. C.

1911. Polyethylene push. Anon. *Oil Gas J.*, 6.9.54, **53** (18), 99.—A table lists 11 companies now making the plastic, or which have plants under construction. A brief review is given of manufacture, properties, and uses of polyethylene. G. A. C.

1912. Patents. U.S.P. 2,671,102 (17.6.49; 2.3.54). J. W. Jewell, assr to M. W. Kellogg Co. Fischer–Tropsch process with fluidized cat.

U.S.P. 2,671,103 (Germany 28.10.49; 2.3.54). H. Kolbel, K. Moers, and P. Ackermann, assrs to Rheinpreussen Akt. Fischer–Tropsch process carried out by passing synthesis gas into a hydrocarbon oil suspension of the cat.

U.S.P. 2,671,104 (22.3.50; 2.3.54). J. H. Grahame, K. E. Kavanagh, and T. H. Whaley, assrs to Texas Co. Production of motor fuel from Fischer–Tropsch products.

U.S.P. 2,671,119 (1.4.49; 2.3.54). J. K. Mertzweiller, assr to Standard Oil Development Co. Hydrogenation of OXO alcohol bottoms.

U.S.P. 2,671,718 (23.12.48; 9.3.54). E. G. de Coriolis, assr to Surface Combustion Corpn. Supplement gas is made by converting a mixture of hydrocarbon vapour, air, and steam to a producer gas–water gas mixture in the presence of an externally heated cat and mixing the product with a hydrocarbon vapour.

U.S.P. 2,671,719–21 (3.8.46; 9.3.54). W. K. Lewis and E. R. Gilliland, assrs to Standard Oil Development Co. Production of mixture of CO and H_2 by reacting a fluidized metal oxide with a hydrocarbon to form a gas containing CO_2 and steam and to convert the metal oxide to metal, and then converting further hydrocarbon with the gas so formed to a mixture of CO and H_2 under the cat influence of the metal.

U.S.P. 2,671,722 (23.3.50; 9.3.54). S. B. Sweetser and R. H. Mueller, assrs to Standard Oil Development Co. Synthesis gas is made by subjecting a fluidized mass of solid carbonaceous material to reaction with steam and treating the gas formed with char particles produced in the process, in a separate zone at 75°–400° F, to remove sulphur compounds.

U.S.P. 2,671,723 (23.3.50; 9.3.54). C. E. Jahnig and E. J. Gornowski, assrs to Standard Oil Development Co. Similar to U.S.P. 2,671,722, but the gases are treated with char particles together with added air at 400°–1000° F.

U.S.P. 2,671,764 (1.10.51; 9.3.54). D. K. Sacken, assr to Jefferson Chemical Co. Alkali metal sulphate is incorporated in a supported silver surface cat as a promoter.

U.S.P. 2,671,766 (1.10.51; 9.3.54). D. K. Sacken, assr to Jefferson Chemical Co. Silver surface cat for the oxidn of olefins to olefin oxides are made by co-precipitating silver oxide and a silver salt, removing the latter, and depositing the residual oxide on a support.

U.S.P. 2,671,812 (30.10.51; 9.3.54). J. W. Sparks and J. O. Knoblock, assrs to Standard Oil Co. *Sec*-alcohols are made by reacting an ozonide of an olefin with a Grignard reagent and hydrolysing the product.

U.S.P. 2,671,814 (10.11.50; 9.3.54). J. K. Mertzweiller, assr to Standard Oil Development Co. An olefinic feed stock is reacted with formaldehyde or trioxymethylene to convert the tetra-substituted *tert*-olefins to metadioxanes and unsaturated alcohols, and the residual olefins are subjected to the OXO process. The products from both reactions are converted to primary alcohols.

U.S.P. 2,672,402 (23.5.51; 16.3.54). C. A. Stokes, assr to Godfrey L. Cabot Inc. Carbon black and synthesis gas are produced by introducing: (1) a gaseous medium containing a hydrocarbon oil; (2) nitrogen-free recycle gas; and (3) substantially pure oxygen into a combustion space, maintaining reaction temp by partial combustion of the hydrocarbon oil and the recycle gas, separating carbon black from the tail gas, recycling a portion of the tail gas, and separating CO_2 from the remainder of the tail gas to leave synthesis gas.

U.S.P. 2,672,410 (1.12.49; 16.3.54). W. J. Mattox, assr to Standard Oil Development Co. In the production of synthesis gas by reacting solid carbonaceous materials with steam and oxygen the formation of CO_2 is suppressed by adding a metal halide.

U.S.P. 2,672,438 (Netherlands 30.9.49; 16.3.54). H. J. den Hertog and P. Bruin, assrs to Shell Development Co. Abnormal addition of HCl to unsaturated compound of at least 3 carbon atoms is effected in the presence of HBr and under the influence of a silent electric discharge.

U.S.P. 2,672,439 (Netherlands 30.9.49; 16.3.54). H. J. den Hertog and P. Bruin, assrs to Shell Development Co. Abnormal addition of HBr to olefinic compounds is effected under the influence of a silent electric discharge.

U.S.P. 2,672,440 (Netherlands 7.8.50; 16.3.54). H. J. den Hertog and P. Bruin, assrs to Shell Development Co. Normally gaseous olefins are contacted with water vapour under the influence of a silent electric discharge at a temp below 150° C for a period of not more than 1 minute to form chiefly primary saturated aliphatic alcohols having twice the number of carbon atoms contained in the olefin.

U.S.P. 2,672,488 (5.5.49; 16.3.54). E. L. Jones, assr to Phillips Petroleum Co. Partial oxidn of methane.

U.S.P. 2,672,490 (15.3.49; 16.3.54). B. E. Roetheli assr to Standard Oil Development Co. Dehydrogenation of butane with fluidized cat containing chromium oxide on alumina.

U.S.P. 2,673,216 (Netherlands 28.3.50; 23.3.54). M. L. Goedkoop, assr to Staatsmijnen in Limburg. Aromatic polycarboxylic acids are made by forming a suspension of subdivided solid carbonaceous material, such as petroleum coke or pitch, in sulphuric acid, adding nitric acid, heating to 130°–230° C and continuing the addition of nitric acid.

U.S.P. 2,673,221 (18.1.52; 23.3.54). R. J. Schrader, H. S. Young, and H. I. Berntsen, assrs to Eastman Kodak Co. In the production of ethyl alcohol by reacting ethylene and steam in presence of a hydration cat and a recycled gas stream, the free oxygen content of the gases coming into contact with the cat is maintained at a value not exceeding 0·2%.

U.S.P. 2,673,794 (G.B. 16.3.51; 30.3.54). N. H. Williams, assr to Humphreys and Glasgow Ltd. Cyclic process for the production of gas from hydrocarbons and preheated steam and/or carbon dioxide in the presence of a cat.

U.S.P. 2,673,834 (31.10.49; 30.3.54). D. R. Stevens and S. C. Camp, assrs to Gulf Research and Development Co.

Alkylated phenols are stabilized by washing with a non-acid aq medium and then contacting with an adsorbent clay at 70°–150° C.

U.S.P. 2,673,884 (6.12.51; 30.3.54). C. L. Thomas. Fluoro-olefins are made by introducing chlorine and an olefin into an aq system containing fluoride ions and dehydrochlorinating the chlorofluoro compound formed. J. M. S.

U.S.P. 2,677,604 (14.12.46; 4.5.54). K. J. Nelson, assr to Standard Oil Development Co. Method of contacting fluids with a dense turbulent mass of finely divided solids having a well defined upper level in a treating zone at constant conditions of treating temp and solids residence time.

U.S.P. 2,678,264 (12.8.47; 11.5.54). E. S. Corner, assr to Standard Oil Development Co. A method for converting a gaseous hydrocarbon into a gas containing hydrogen and carbon monoxide.

U.S.P. 2,678,907 (8.4.52; 18.5.54). R. H. Baldwin and R. E. Bley, assrs to E. I. du Pont de Nemours and Co. Controlling the flow of T.E.L. reaction masses.

U.S.P. 2,678,923 (19.3.51; 18.5.54). R. C. Hansford, assr to Socony-Vacuum Oil Co. An improved dehydrogenation–dehydrocyclization cat to be used under hydrogen pressures of at least *ca* 200 p.s.i., which comprises *ca* 10% by wt to *ca* 35% by wt of chromia, calculated as chromium sesquioxide, from *ca* 0·2% by wt to *ca* 1·5% by wt of fluorine, and the balance alumina. D. A. R.

Ger.P. 913,420, 6.5.54. — Povenz, assr to Farbenfabriken Bayer AG, Leverkusen-Bayerwerk. Process for halogenating alkyl-substituted, saturated or unsaturated cyclic hydrocarbons.

Ger.P. 914,375, 20.5.54. — Nienburg, — Helms, and — Pistor, assrs to Chem. Verwertungsges. Oberhausen m.b.H., Oberhausen (Rhld.). Method for producing O_4-containing compounds.

Ger. P. 914,247, 20.5.54. — Keller, assr to Bergwerksverband zur Verwertung von Schutgrechten der Kohlentech G.m.b.H., Dortmund. Method for producing addn compounds of thiourea.

BrennstChemie, 1954, **35** (11–12). R. T.

METERING AND CONTROL

1913. Gravity measurements on products line. D. C. Brunton and T. P. Pepper. *Oil Gas J.*, 30.8.54, **53** (17), 79.—The Density Gammagage measures gravity of contents of pipeline or tank by the absorption of a γ-ray beam from a radioactive source. The instrument, made by Isotope Products Ltd, is successfully used for direct and continuous measurement by Trans Northern Pipe Line Co. Figures show schematic arrangement of equipment and records of products gravity over a 6-hr period. G. A. C.

1914. Patents. U.S.P. 2,671,340–3 (28.1.50, 30.9.50, 26.5.51, 30.11.51; 9.3.54). R. B. Jacobs and S. F. Kapff, assrs to Standard Oil Co. Apparatus for automatically and continuously determining the vapour pressure of liq.

U.S.P. 2,671,645 (G.B. 27.1.48; 9.3.54). M. Buis, assr to Shell Development Co. Apparatus for rapidly mixing and controlling the temp of immiscible liq.

U.S.P. 2,672,751 (24.9.51; 23.3.54). D. E. Lupfer, E. E. Kleinmann, and W. R. Eddy, assrs to Phillips Petroleum Co. Apparatus for automatically determining the time–temp curve of a soln.

U.S.P. 2,672,758 (21.10.49; 23.3.54). H. C. Hibbard, assrs to Standard Oil Development Co. Pressure responsive apparatus for measuring differences in elevation between spaced points. J. M. S.

Ger.P. 913,362, 29.4.54. — von den Berghen, assr to Rota Apparate- und Maschinenbau Dr Hennig KG, Aachen. Flowmeter. (Addn. to Pat. 867,307.)

Ger.P. 914,015, 13.5.54. — Mütschele, Ludwigsburg (Württ.). Filling and abstracting valve for liq gases under pressure. (Addn. to Pat. 903,463.)

Ger.P. 914,016, 13.5.54. — Mütschele, Ludwigsburg (Württ.). Filling and abstracting device for liq gases under pressure. (Addn. to Pat. 903,463.)

Ger.P. 914,445, 20.5.54. — Gast, Klausenmühle über Bensheim. Registering torsion balance with elec compensation.

BrennstChemie, 1954, **35** (11–12). R. T.

PRODUCTS

CHEMISTRY AND PHYSICS

1915. Key to better extraction. H. F. Wiegandt and R. L. von Berg. *Chem. Engng*, 1954, **61** (7), 183–8.—The correct application of energy from an external source can speed up mass transfer in liq–liq extraction as much as tenfold. Here, pulse columns are described and their potentialities evaluated. D. M.

1916. What is the octane picture? Pt I. Trends and forecasts. J. S. Bellah and W. E. Morris. *Petrol. Refin.*, 1954, **33** (8), 111–12.—Graphical estimates of future gasoline qualities, based on an interpretation of available data, are presented and compared with estimated concurrent passenger car requirements. R. D. S.

1917. Structure of breath deposits on dielectric oils. A. Brin. *Nature, Lond.*, 1954, **174**, 468.—Extent of ageing of insulating oil can be detected by observation (low-power microscope) of water droplets deposited on oil surface by breathing thereon. On unused oil, droplets coalesce into bigger droplets, on artificially aged oils (10 hr, 120° C, Cu), droplets join up in elongated groups, on used oils droplets remain separate; illustrations. V. B.

ANALYSIS AND TESTING

1918. New test unit shows gum not only factor affecting gasoline stability. A. V. Cabal. *Petrol. Process.*, 1954, **9** (7), 1044–7.—It is shown that gum build-up alone can no longer be used as the sole criterion of gasoline engine induction system deposit-forming characteristics. The effect of anti-oxidants, peroxides, and phenols is discussed with relation to the ASTM gum content of the fuel. J. W. H.

1919. Rapid determination of lead tetra-ethyl in fuels. J. Smelik. *Prakt. Chem.*, 1954, **5**, 9–12; *Chim. et Industr.*, 1954, **72**, 274.—Two methods for polarographic estimation of Pb; (1) gasoline decomp by Br, PbBr washed with petroleum ether, dissolved in HNO_3, solution analysed; (2) dissolve gasoline in monoethyl ester of ethylene glycol, reflux at 100° C to decomp TEL, determine Pb quant by comparison with standard. 5 tests/hr. Olefins in gasoline may interfere. V. B.

1920. Useful device for flash point determination. A. Stevenson. *Lab. Practice*, 1954, **3**, 388–9.—Description and drawing of glass beaker fitted with magneto-energized spark-gap for determining closed flash, both above and below room temp, and applicable to liq and solids. Results are somewhat below those with conventional equipment. V. B.

1921. Patents. U.S.P. 2,671,337 (31.3.51; 9.3.54). H. A. Hulsberg, assr to Universal Oil Products Co. Apparatus for measuring hydrogen concn in a gaseous mixture.

U.S.P. 2,673,297 (13.6.49; 23.3.54). E. C. Miller, assr to Phillips Petroleum Co. Method of analysing a sample by use of its radiation absorption characteristics.

U.S.P. 2,673,298 (6.9.49; 23.3.54). J. W. Hutchins, assr to Phillips Petroleum Co. Recording infra-red gas analyser. J. M. S.

GAS

1922. Patent. Ger.P. 913,810, 13.5.54. — Totzek and — Linder, assrs to Koppers G.m.b.H., Essen. Method for producing valuable combustible gases from hydrocarbons. (Addn. to Pat. 897,611.)
BrennstChemie, 1954, **35** (11–12). R. T.

ENGINE FUELS

1923. Combustion chamber deposit control. C. L. Fleming, N. V. Hakala, and L. E. Moody. *Petrol. Refin.*, 1954, **33** (8), 88–91.—Field tests carried out by Standard Oil Development Co indicate that the main problem raised by combustion chamber deposits is the increased octane requirement of the engine. Surface ignition and spark plug fouling are relatively unimportant at present. The soundest solution is the use of high quality fuels and lubricants with low deposit-forming tendencies. The use of tricresyl phosphate as a gasoline additive gave increased deposits and detonation requirements, greater power loss, and poorer fuel economy. R. D. S.

1924. How effective are gasoline additives? F. C. Burk, L. J. Test, and H. R. Jackson. *Petrol. Refin.*, 1954, **33** (8), 97–100.—A description of the field and lab procedures used by Atlantic Refining Co to evaluate various additives. Phosphorus-containing materials are found to be the most effective and practical of those tested, but they may have undesirable side effects. It is shown that the apparent need for, and effectiveness of, various additives is dependent upon the severity of both the engine and the operating conditions under which they are evaluated. R. D. S.

1925. Improve fuel with phosphorus additives. R. E. Jeffrey, L. W. Griffith, E. Dunning, and B. S. Baldwin. *Petrol. Refin.*, 1954, **33** (8), 92–6.—Surface ignition and spark plug fouling are widespread problems today, according to field and lab tests performed by Shell Oil Co. These tests indicate that tricresyl phosphate is very effective in eliminating these problems and has no adverse effects on engine life. R. D. S.

1926. Pre-ignition problem. G. Weber. *Oil Gas J.*, 23.8.54, **53** (16), 114.—Causes and measures necessary to alleviate or prevent pre-ignition occurrence are not yet fully defined. The case for and against additives is summed up, and methods of evaluation, including single cyl, multi-cyl, and road evaluation methods, use of a cathode-ray engine analyser and its applications, are discussed. Fundamental causes of ignition, relative ignition resistance, ignition resistance of mixtures, and effect of T.E.L. are also considered. G. A. C.

1927. Draft German standards. Diesel fuel. Anon. *Erdöl u. Kohle*, 1954, **7**, 515.—DIN 51601. H_2O 0·1% max; d_{15} 0·820–0·860; dist 90% min at 360° C; visc 1·8–10 cs/20° C; flash 55° C min; filterability, summer 0° C, winter −12° C max; S 1% max (1·25%, depending on origin); Conradson C 0·1% max; Zn corrosion 4 max; Cetane No. 40 min (45 min recommended); ash 0·02% max. V. B.

1928. Draft German standards. Alcohol-free motor fuel. Anon. *Erdöl u. Kohle*, 1954, **7**, 514.—DIN 51600. d_{15} 0·710 min; dist (min) 30% at 100° C, 95% at 200° C; 10% at 65/75° C (for Reid v.p. 0·3–0·4 kg/cm² min); Reid v.p. 0·67 kg/cm² max; gum 10 max; O.N. min 72–74 (Motor–Research); T.E.L. 0·06% max; S 0·1% max; corrosive S neg; cold test −20° C max. Permissible relaxations are: 10% at 75° C for 0·3 v.p. if d_{15} >0·750; Reid v.p. 0·9 for winter; S up to 0·25%, depending on fuel origin. V. B.

1929. Patents. U.S.P. 2,673, 144 (10.6.50; 23.3.54). N. A. Huggler, assr to Standard Oil Co. Auxiliary fuel consisting of 25–90 wt % of an alkanol of 1–3 carbon atoms and 10–75 wt % water and containing 500–2000 p.p.m. of a water-sol salt or ester of an aminocarboxylic acid having more than one carboxylic acid group in α-position to a basic nitrogen atom, 200–5000 p.p.m. of an alkaline buffer salt to maintain a pH of at least 7, and 50–500 p.p.m. of a water-sol salt of mercaptobenzthiazole.

U.S.P. 2,673,145 (26.2.48; 23.3.54). W. H. Chandler, assr to Shell Development Co. Reduction of engine wear caused by the sulphur in diesel fuels containing at least 0·2% sulphur is achieved by adding a hydrated base metal nitrate.

U.S.P. 2,673,793 (3.2.50; 30.3.54). J. W. Brodhacker, assr to Commercial Solvents Corpn. Model engine fuel comprising methanol and a mononitroparaffin of 1–3 carbon atoms and 2,2-dinitropropane as an ignition promoter. J. M. S.

Ger.P. 912,849, 22.4.54. — Marischka, assr to Koppers G.m.b.H., Essen. Alternately working water gas plant and its operation.

Ger.P. 912,612, 22.4.54. — Bieger and — Arnolds, assrs to Braunkohle-Benzin AG, Hannover-Kirchrode. Method and producer for water gas manufacture, *e.g.* synthesis gas, by gas circulation.

Ger.P. 913,570, 6.5.54. — Kuhl and — Hansen, assrs to Brennstoff-Tech. G.m.b.H., Essen. Process and plant for water gas production from low-tempt coke.

Ger.P. 913,531, 6.5.54. — Terres, Karlsruhe. Process for dehydrating and enriching H_2O-containing fuels. (Addn. to Pat. 903,813.)
BrennstChemie, 1954, **35** (11–12). R. T.

GAS OIL AND FUEL OIL

1930. Oil in the steel industry. Anon. *Petrol. Times*, 3.9.54, **58** (1489), 901.—The survey is given of an article published in the *Monthly Statistical Bulletin* of the British Iron and Steel Federation. The steel industry is shown to be the largest single purchaser of fuel oil in the U.K. A limiting factor in its use is cost; factors in favour include advantageous use in firing open-hearth furnaces. G. A. C.

1931. Fuel Research Board report for 1953. Anon. *Petrol. Times*, 3.9.54, **58** (1489), 914.—A review is given of the above report for 1953. Subjects include investigations in co-operation with the Admiralty on the thickening of residual fuels during storage, the synthesis of oils and chemicals from coal, flow properties of residual fuel oils, composition of asphaltene–resin micelles, measurement of viscous properties of oils, possibility of breaking emulsions of sea water in fuel oils, and thermal decomposition of paraffin hydrocarbons. G. A. C.

1932. Patents. U.S.P. 2,672,408 (28.11.50; 16.3.54). W. H. Bonner, assr to Shell Development Co. Blended fuel oil consisting of at least 60% straight-run fuel oil, the balance being cracked fuel oil, is stabilized against colour deterioration by adding 0·001–10% of an oil-soluble *tert*-alkylamine, each alkyl radical of which contains at least 4 carbon atoms. J. M. S.

U.S.P. 2,678,262 (28.3.50; 11.5.54). R. J. Neely and R. P. Gilmartin, assrs to Gulf Research and Development Co. Stable fuel oil compositions. D. A. R.

LUBRICANTS

1933. AIOC lube expansion cuts imports. Anon. *Petrol. Refin.*, 1954, **33** (7), 130.—Next year imports of lub oil from the U.S.A. into Western Europe will be halved. European production of lubricants is expected to be 21 million brl this year, of which Anglo-Iranian, or its continental associates, will produce nearly 3 million brl. R. D. S.

1934. Silica gel percolation aids in methods for producing high V.I. lube oils. Anon. *Petrol. Process.*, 1954, **9** (7), 1091–4.—The preparation of a high V.I. petroleum lub oil in which the only components present are those having a high V.I. is reviewed. Details of this new method are taken from U.S.P. 2,674,568, by Standard Oil Co. J. W. H.

1935. Patents. U.S.P. 2,671,036 (1.11.48; 2.3.54). K. H. Obermeit, assr to Standard Oil Co. Composition comprising 50–75 vol lub oil and 50–25 vol of a mixture of *o*-cresol and a potassium linseed oil soap soln is used for cleaning I.C. engines.

U.S.P. 2,671,051 (4.9.51; 2.3.54). R. J. Moore, assr to Shell Development Co. Lubricant comprising a waxy hydrocarbon lub oil having a visc between 50 and 250 SSU at 100° F and as a pour point depressant a hydrocarbon wax bearing a cyclic end group.

U.S.P. 2,671,753 (19.10.50; 9.3.54). J. G. Lillard, assr to Standard Oil Development Co. Oxidn inhibitors suitable for lub oils are made by extracting with tetrahydrofurfuryl alcohol a phenol extract of a Panhandle medium motor dist fraction. The alcohol is removed from the extract to leave the oxidn inhibitor.

U.S.P. 2,671,758 (27.9.49; 9.3.54). J. R. Vinograd and F. H. Stross, assrs to Shell Development Co. Colloidal inorganic bases are added to oils containing detergent additives to prevent deterioration due to acidic impurities and degradation products.

U.S.P. 2,671,759 (12.12.50; 9.3.54). G. W. Eckert and T. W. Langner, assrs to Texas Co. Rust preventive grease comprising a lub oil, 7–25 wt % lithium soap of a mixture of a hydroxy fatty acid and a saturated non-hydroxy fatty acid, 0·7–1·05 wt % calcium mahogany sulphonate, 2–3 wt % acids produced by the partial oxidn of petroleum wax, and 2–3 wt % tallow.

U.S.P. 2,671,760 (18.5.51; 9.3.54). W. S. Port, J. W. O'Brien, and D. Swern, assrs to U.S.A. (Secretary of Agriculture). V.I. improvers are made by polymerizing a mixture of vinyl acetate and vinyl palmitate.

U.S.P. 2,671,761 (26.6.50; 9.3.54). M. L. Kalinowski and M. Feller, assrs to Standard Oil Co. Flushing oil consisting of 2–98 vol % aromatic solvent oil boiling in the range 350°–650° F and having an API gravity in the range 10°–20°, and 98–2 vol % of "ebony fat," *i.e.* a propane-insoluble residue of a crude fatty material.

U.S.P. 2,672,443 (22.11.48; 16.3.54). J. J. Screnock, assr to Johns-Manville Corpn. Self-lubricating bearing comprising a matrix of infusible phenol–aldehyde resin having distributed therein graphite, heat-resistant fibres, and wood flour saturated with a polyhydric alcohol ester of a non-drying fatty acid.

U.S.P. 2,672,444 (5.6.48; 16.3.54). J. I. Wasson and D. L. Bonham, assrs to Standard Oil Development Co. Rust preventive composition comprising a lub oil, 0·1–10 wt % of a mono-oleate ester of a polyglycerol, 0·1–10 wt % of a metal sulphonate and up to 10 wt % of degras.

U.S.P. 2,672,445 (29.4.50; 16.3.54). W. T. Stewart, C. D. Newnan, and N. W. Furby, assrs to California Research Corpn. Transformer oils comprising an alkylene oxide polymer of lub oil visc, a selenide having at least one aliphatic group of at least 10 carbon atoms attached to the selenium atom, and a dihydroxyanthraquinone.

U.S.P. 2,672,446 (30.11.49; 16.3.54). L. W. Mixon and R. W. Watson, assrs to Standard Oil Co. Lub oils containing a copolymer of a dialkyl itaconate and an alkyl methacrylate.

U.S.P. 2,672,447 (9.8.49; 16.3.54). W. T. Stewart, C. D. Newnan, and N. W. Furby, assrs to California Research Corpn. Transformer oils comprising a lub oil, a dialkyl selenide containing 12–30 carbon atoms in each alkyl group and 1,2-, 1,4-, 1,5-, or 1,8-dihydroxyanthraquinone.

U.S.P. 2,672,448 (27.9.52; 16.3.54). C. D. Newnan and N. W. Furby, assrs to California Research Corpn. Transformer oils comprising a lub oil, a *tert*-alkylphenol antioxidant, and alizarin, quinizarin, anthrarufin, chrysazin, or 2-methyl-1,4-dihydroxyanthraquinone.

U.S.P. 2,672,976 (29.4.52; 23.3.54). W. A. Overath, R. Kallenbach, and H. Fleischhauer, assrs to Parker Rust Proof Co. Lubricants for phosphate-coated metals comprise an aq emulsion of the reaction products of wool fats with aq alkali metal hydroxide.

U.S.P. 2,673,161 (27.11.51; 23.3.54). E. A. Dieman, assr to Standard Oil Co. Oils containing an alkali metal soap of an oil-sol sulphonic acid and an alkali metal or alkaline earth metal soap of the acidic constituents of a polymeric residue obtained in the Fischer–Tropsch process.

U.S.P. 2,673,175 (21.4.51; 23.3.54). R. K. Stratford, W. A. Jones, and F. A. Stuart, assrs to Standard Oil Development Co. Lub oil for I.C. engines is made by contacting a solvent extracted, hydrogenated mineral lub oil with free oxygen at 200°–400° F until a product having a Sap. No. of 20–70 is produced, and treating the product with a neutralizing agent.

U.S.P. 2,673,183 (16.8.49; 23.3.54). E. C. Hughes and D. Frazier, assrs to Standard Oil Co. Cutting oil comprising a mineral oil, at least 3 wt % of a neutralized, oxidized, solvent refined, light mineral oil, and dissolved sulphur.

U.S.P. 2,673,184 (27.2.53; 23.3.54). H. J. Morway, D. W. Young, and D. L. Cottle, assrs to Standard Oil Development Co. Lub grease comprising a C_1–C_{18} alcohol diester of the dimer of linoleic acid thickened with a lithium soap of a saturated fatty acid.

U.S.P. 2,673,185 (2.12.48; 23.3.54). J. H. Bartlett, assr to Standard Oil Development Co. Pour point depressant for waxy lub oils is formed by copolymerizing vinylacetate with a compound of the formula $CH_2{:}CH{\cdot}CH_2O{\cdot}CO{\cdot}OR$, where R is a straight chain hydrocarbon radical of 8–18 carbon atoms.

U.S.P. 2,673,196 (21.5.51; 23.3.54). E. C. Hughes and J. D. Bartleson, assrs to Standard Oil Co. Phosphorus sulphide–organic compound metal derivatives for use as lub oil additives are treated with a selective solvent to remove materials impairing their corrosion-inhibiting properties.

U.S.P. 2,673,818 (27.2.51; 30.3.54). P. Woog, assr to Compagnie Française de Raffinage S.A. Metal surfaces are lubricated by applying a continuous, thin, dry layer of barium, lead, or zinc stearate by dry rubbing and then applying a lub oil to the stearate layer.

U.S.P. 2,673,838 (14.12.48; 30.3.54). F. Veatch and E. C. Persing, assrs to Standard Oil Co. Thixotropic oils consist of fully hydrogenated castor oil dispersed as solid particles in an oil base.

U.S.P. 2,673,839 (28.4.51; 30.3.54). A. D. Kirshenbaum and J. M. Boyle, assrs to Standard Oil Development Co. Lub oil containing a condensation product made by reacting a sulphide of the formula $C_nX_{2n+1}{\cdot}CO{\cdot}S(C_nH_{2n})CO{\cdot}OR$, wherein n is 1, 2, 3, or 4, X is halogen or hydrogen, at least one X being halogen, and R is a hydrocarbon radical, with a thiocarbamic acid of the formula $R_2'N{\cdot}CZ{\cdot}ZY$, wherein R′ is hydrogen or a hydrocarbon radical, Z is oxygen or sulphur, at least one Z being sulphur, and Y is hydrogen or a metal.

U.S.P. 2,673,840 (29.12.49; 30.3.54). O. M. Reiff and A. P. Kozacik, assrs to Socony-Vacuum Oil Co. Antioxidants for lub oils comprise ketones of the formula: $RCHX{\cdot}CH_2(CH_2)_mCO{\cdot}(CH_2)_m[CHX{\cdot}CH_2]_nR$, wherein X is a thienyl group, R is an alkyl group of 1–10 carbon atoms, m is a number from 0 to 10, and n is 0 or 1.

U.S.P. 2,673,881 (31.10.51; 30.3.54). J. S. Weissberg and J. R. Jones, assrs to Standard Oil Development Co. Lub oil additives are alkyl phenol sulphides which have been

treated with a basic barium compound and then hydrolized, or metal salts of such sulphides. J. M. S.

U.S.P. 2,677,659 (21.3.52; 4.5.54). O. M. Reiff, assr to Socony-Vacuum Oil Co. A lub oil composition having a stabilized low pour point comprising a major proportion of a waxy mineral lub oil, a minor proportion, sufficient to lower the pour point of the oil, of a metal salt of an organic acid having a wax-substituted aryl nucleus therein, and a minor amount, sufficient to stabilize the lowered pour point of the oil, of an organic acid.

U.S.P. 2,677,660 (21.3.52; 4.5.54). O. M. Reiff, assr to Socony-Vacuum Oil Co. A lub oil composition having a stabilized low pour point comprising a major proportion of a waxy mineral lub oil, a minor proportion, sufficient to lower the pour point of the oil, of a metal salt of an organic acid having a wax-substituted aryl nucleus therein, and a minor amount, sufficient to stabilize the lowered pour point of the oil, of an unsubstituted nitrile or an unsubstituted acyclic amine.

U.S.P. 2,677,662 (2.8.48; 4.5.54). L. A. Mikeska, S. B. Lippincott, and A. H. Popkin, assrs to Standard Oil Development Co. A lubricating composition consisting essentially of a major proportion of a mineral lub oil having combined therein from 0·05 to 10% of a copolymer of maleic anhydride and a vinyl alkyl ether, the copolymer having been esterified with an aliphatic alcohol.

U.S.P. 2,678,918 (20.3.46; 18.5.54). A. A. Bondi, assr to Shell Development Co. A soda soap base lub grease containing 0·05 to *ca* 1% of a polyethylene glycol having an average mol. wt. in excess of 200, the percentage range being taken on the wt of the grease.

U.S.P. 2,678,919 (29.12.48; 18.5.54). T. S. Tutwiler and J. H. Bartlett, assrs to Standard Oil Development Co. A lub oil composition consisting essentially of a major proportion of a waxy mineral lub oil and *ca* 0·1–3·6% by wt of a copolymer of a C_8–C_{24} alkyl ester of itaconic acid and a compound having the formula

$$CH_2=C(R)-COOCH_3$$

wherein R is = H or $-CH_3$.

U.S.P. 2,679,479 (30.9.52; 25.5.54). W. H. Peterson and W. Saarni, assrs to Shell Development Co. Inorganic-gelling-agent-thickened fluorocarbon grease compositions.

U.S.P. 2,679,480 (1.11.52; 25.5.54). C. G. Brannen and E. A. Swakon, assrs to Standard Oil Co. A lubricant grease comprising essentially a lubricant vehicle thickened with *ca* 10 to *ca* 70% by wt of an indogen compound melting above *ca* 250° F. D. A. R.

Ger.P. 914,007, 13.5.54. — Engel and — Simon, assrs to BASF AG, Ludwigshafen (Rhein). Method for producing lub improvers.
BrennstChemie, 1954, **35** (11–12). R. T.

BITUMEN, ASPHALT, AND TAR

1936. Stabilization of sandy soils with heavy slow curing asphalt. J. R. Banning. *Rds & Str.*, 1954, **97** (7), 72.—A very complex highways problems exists in Nebraska for 2 reasons. One reason is the climate, which involves frequent changes in temp and a rainfall of 15–30 inches annually. The second reason is that the soil is very sandy. Based upon experience in other areas, from which it was learned that heavier cutbacks and even penetration grade bitumens, like 60/70 penetration, gave increased stability, the stabilization was effected using S.C.6 cutback. This was followed by the application of R.C.2 cutback at the rate of 7 sq. yd/gal as a seal coat. Full details of the work on the job are given. R. H.

1937. Heat resistant properties of additives for bituminous materials. P. F. Critz. *Publ. Rds, Wash.*, 1954, **28** (3), 41.—The use of additives to prevent stripping of hot-laid, hot-mixed bituminous pavements has not always been found to be satisfactory. One of the reasons was thought to be the lack of heat stability of the additives employed. 3 additives have been tested from this point of view, using bitumen from one particular source. It was found that: (1) prolonged heating of the treated bitumen at high temp prior to mixing, reduced the effectiveness of the additives; (2) overheating the aggregate was more serious in this respect; (3) even under the severe conditions of the tests described, the additives were effective in specimens subjected to the immersion compression test, in increasing the percentage of retained strength, and in reducing the moisture absorption and volumetric swell. Full details of the experiments are given. R. H.

1938. A study of dispersing agents for particle size analysis of soils. A. M. Wintermyer and E. B. Kinter. *Publ. Rds, Wash.*, 1954, **28** (3), 55.—The essential first stage in the standard procedure for determining the particle size analysis of soils is to achieve an efficient dispersion of the soil particles in water. 19 different dispersing agents have been compared, using 14 soils and 2 clay minerals of widely differing types. 13 of the dispersants were found to be completely unsatisfactory. Sodium metasilicate was among the less satisfactory materials, while phosphate compounds were found to be most effective. Full experimental details are included. R. H.

1939. A comparison of rapid methods for the determination of liquid limits of soils. F. R. Olmstead and C. M. Johnston. *Publ. Rds, Wash.*, 1954, **28** (3), 50.—The standard AASHO test for determining the liq limit of a soil involves testing the soil for flow characteristics at 3 different moisture contents. A rapid method devised by Cooper and Johnson of the Washington State Dept of Highways, called the chart method, involves testing the soil at only one moisture content and interpolating the result from a series of prepared "moisture content/no. of blows" curves based upon different types of soil. This procedure has been developed still further by transposing the data to a mathematical formula and to a slide rule. The precisions of the methods are discussed. R. H.

1940. Bituminous materials, their processing, and use mirrored in newer German patent literature. (Complement). H. Hoffmann. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (6), 188–9; **5** (7), 219–20.—Continued classification as described in this journal, 1953, **4** (1), 15. R. T.

1941. Comparison of American ASTM standards for bitumen roofing papers with corresponding German standard DIN 52128. H. Ziegler. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (6), 167–72.—The numerous ASTM standards compared with the single DIN standard indicate the development of the industry in America. R. T.

1942. Processing and testing composition roofing. A. W. Rick. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (6), 190–3.—In Pt 9 various sealings with raw and filled roofing paper—drains, bridges, balconies—are discussed. Conventional tests for raw paper and additives are discussed in relation to current German standards. R. T.

1943. New road tar consistometer. L. Deile. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (6), 178.—Consistometer with elec temp control to $\pm 0{\cdot}01°$ C for max of 12 simultaneous estimations of road tar visc. R. T.

1944. Short process for determining setting rate of road tars. H-G. Franck and O. Wegener. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (6), 165–6.—Vaporization loss determination after 2 hr ageing at 80° C in a drying oven calibrated with 1-methylnaphthalene, is proposed as a short method for measuring setting rate of road tars. Valuation is based on 15% loss of 1-methylnaphthalene. R. T.

1945. 25 years asphalt hydraulic construction in Germany. W. Becker. *Bitumen, Teere, Asphalte, Peche*, 1954, **5** (6), 175–7.—Brief discussion with 118 literature refs. R. T.

1946. Patents. U.S.P. 2,673,164, (1.8.50; 23.3.54). E. C. Hughes and H. M. Stine, assrs to Standard Oil Co. Improving adhesion of bitumen by adding a reaction product of phosphorus sulphide and an aq soln and heating the mixture at 212°–500° F for at least 4 hr.

U.S.P. 2,673,813 (21.12.50; 30.3.54). M. Feller and F. H. MacLaren, assrs to Standard Oil Co. Bitumen dope comprising a mixture of a polyvalent metal green acid soap and ebony fat. Ebony fat is the propane-insol residue obtained in the solvent extraction of a crude animal or vegetable oil, fat, or fatty acid with liq propane.

U.S.P. 2,673,814 (30.6.50; 30.3.54). F. H. MacLaren, assr to Standard Oil Co. Bitumen doped with 0·1–30% of ebony fat.

U.S.P. 2,673,815 (4.11.50; 30.3.54). J. D. Bartleson, assr to Standard Oil Co. Adhesion properties of bitumen are improved by mixing with 0·06–0·25 wt % of P_4S_3 dispersed in an oil miscible with the bitumen and heating to 300°–400° F for 0·5–2 hrs. J. M. S.

U.S.P. 2,677,620 (9.8.50; 4.5.54). N. E. Lemmon, R. E. Karll, and M. Feller, assrs to Standard Oil Co. A composition of matter comprising a bitumen and a small amount of the phosphorus- and sulphur-containing unneutralized reaction product of a phosphorus sulphide and an olefin hydrocarbon.

U.S.P. 2,679,462 (18.12.51; 25.5.54). L. T. Monson, assr to Petrolite Corpn. Strip-resistant bituminous composition. D. A. R.

Ger.P. 914,008, 13.5.54. — Hilgenstock, assr to Bergbau-AG, Lothringen, Bochum. Method for producing hard pitch by tar dist in waste gas stream.

Ger.P. 914,132, 20.5.54. — Jenker, assr to Mannesmann AG, Düsseldorf. Method for producing bitumen-like substances. (Addn. to Pat. 752,577.)
BrennstChemie, 1954, **35** (11–12). R. T.

SPECIAL HYDROCARBON PRODUCTS

1947. Hydrocarbons from cellulosoic wastes. Pts I and II. H. Heinemann. *Petrol. Refin.*, 1954, **33** (7), 161–3; **33** (8), 135–7.—Digestion of cellulosic material such as sugar cane or wood with caustic soda, hydrogenation of the bitumen produced, and dist of the final product gives a range of fractions almost identical with those obtained from petroleum crudes, ranging from gasoline to asphalt. R. D. S.

1948. Filling compounds for power cable accessories. A. King. *Elect. Times*, 1954, **126**, 315–21, 353–6.—Filling (" box ") compounds comprise 3 main groups, bituminous, oil–rosin, and gum and vegetable-pitch based (oil-resisting). First group is covered by BS 1858, test requirements of which are discussed. Second group contains 15–50% rosin; visc measured by IP methods, results indicate that setting pt (IP 54/42) is equiv to visc of 25×10^8 cs. Curves given for variation of tan δ and electric strength with temp for oil-rosin compound. Factors governing choice of compound considered. V. B.

1949. Patents. U.S.P. 2,670,782 (8.6.51; 2.3.54). C. G. Elliott, assr to Armstrong Cork Co. Cyclic hydrocarbon fractions obtained as a by-product of the pyrolysis of petroleum, boiling between 200° and 500° C, containing *ca* 10% aromatics and having an iodine no. of 190–250, are used with a glyceride siccative oil-modified alkyd resin and a filler in making hard surface floor coverings. J. M. S.

U.S.P. 2,678,338 (28.10.50; 11.5.54). C. B. Linn, assr to Universal Oil Products Co. A process for producing *cyclo*hexadiene which comprises reacting a mixture of a *cyclo*hexenone and a *cyclo*hexenol at a temp of from *ca* 100° to *ca* 200° C in the presence of an aq soln of sulphuric acid or magnesium chloride cat and recovering the resultant *cyclo*hexadiene.

U.S.P. 2,678,951 (26.12.51; 18.5.54). W. C. Smith and B. Masterton, assrs to Shell Development Co. A process of producing 2,3,5-trimethyl phenol which comprises contacting methanol and 3,5-xylenol in the vapour phase with an adsorptive alumina cat at 475°–550° C in a mol ratio of 0·5 : 1 to 1 : 1 mol of methanol per mol of xylenol and adding to the reaction mixture 2–6 mol of steam per mol of xylenol fed to the reaction.

U.S.P. 2,679,540 (28.7.50; 25.5.54). C. H. O. Berg, assr to Union Oil Co of California. Process and apparatus for acetylene production. D. A. R.

Ger.P. 912,692, 22.4.54. — Brendlein, assr to Deutsche Gold- und Silber-Scheideanstalt formerly Roessler, Frankfurt (M.). Method for producing olefins or their derivatives.

Ger.P. 912,814, 22.4.54. Deutsche Gold- und Silber-Scheideanstalt formerly Roessler, Frankfurt (M.). Method for producing hexahydroxybenzene.
BrennstChemie, 1954, **35** (11–12). R. T.

DERIVED CHEMICAL PRODUCTS

1950. Nitrile rubber for oils and solvents. J. P. McNamee. *Chem. Engng*, 1954, **61** (9), 230–8.—More expensive and more difficult to fabricate than natural rubber, nitrile nevertheless has many important uses as solid forms and sheet linings. D. M.

1951. Petrochemicals today and tomorrow. J. C. Reidel. *Oil Gas J.*, 6.9.54, **53** (18), 83.—A petrochemical survey is presented, listing plant locations, raw materials, and products. Petroleum and natural gas are now bases for 25% of total chemical production, and figure is likely to be doubled in next ten years. G. A. C.

1952. Primary petrochemicals—up 38%. Anon. *Petrol. Process.*, 1954, **9** (7), 1067–9.—Output of petrochemicals during 1953 jumped to 10 billion lb. This is an increase of 38% over previous year's figures. The figures are based on a preliminary report from the U.S. Tariff Commission on 1953 operations in synthetic organic chemicals. J. W. H.

1953. Patent. Ger.P. 913,891, 13.5.54. — Braun, assr to BASF AG, Ludwigshafen (Rhein). Method for producing aromatic 1 : 2-diketones.
BrennstChemie, 1954, **35** (11–12).

COAL, SHALE, AND PEAT

1954. Patents. Ger.P. 912,990, 22.4.54. — Senner and — Miedbrodt, assrs to Pintsch Bamag AG, Berlin. Process and gas producer for dust removal from gas and fuel dust recovery in gasifying fine-grained fuels.

Ger.P. 912,734, 22.4.54. — Schmalfeldt, Castrop-Rauxel. Process for totally gasifying coal dust in suspension.

Ger.P. 912,613, 22.4.54. — Stackel and — Mewes, assrs to Dr C. Otto & Comp. G.m.b.H., Bochum. Plant for continuously gasifying ash-rich fuels.

Ger.P. 913,412, 6.5.54. — Göcke, Bork (Kr. Lüdwigshausen). Low-temp carbonizing plant, *e.g.* for peat.

Ger.P. 913,644, 6.5.54. — Gabel and — Beckenbauer, assrs to Kohle-Oel-Union von Busse KG, in liquidation, Berlin. Process for low-temp carbonization of oil shale.

Ger.P. 913,532, 6.5.54. — Linder, assr to Koppers G.m.b.H., Essen. Method for fuel dust production from peat, etc.

Ger.P. 913,684, 6.5.54. — Beckenbauer and — Hübner, assrs to Kohle-Oel-Union von Busse KG, in liquidation,

Berlin. Process for low-temp dist of bituminous materials underground.
BrennstChemie, 1954, **35** (11–12). R. T.

MISCELLANEOUS PRODUCTS

1955. Patents. U.S.P. 2,672,450 (23.6.50; 16.3.54). H. W. Pearsall, assr to General Motors Corpn. Composition for removing adherent deposits from surfaces of I.C. engines comprising alkylbenzenes having from 7 to 10 carbon atoms, a glycol monomethyl ether, and a lower alkyl ester of ricinoleic acid.

U.S.P. 2,673,844 (22.12.50; 30.3.54). J. R. Gilcrease, assr to Standard Oil Development Co. Rubbery butadiene emulsion polymer in crumb form, the crumbs being coated with pure fibrous wood cellulose. J. M. S.

CORROSION

1956. Preventing corrosion with saran. Anon. *Chem. Engng*, 1954, **61** (7), 264–72.—This thermoplastic material lends itself to many applications in chemical processing. It has excellent resistance to most acids and organic solvents. D. M.

1957. Control of internal corrosion of tankers. W. B. Jupp and C. L. Lamb. *Pipe Line News*, July 1954, **26** (7), 37–41.—Corrosion control reduces maintenance costs, reduces amount of steel used in construction, increases life of tanker, and reduces contamination of cargoes due to bulkhead failures. Corrosion varies with cargoes carried, operating locality, and was found to proceed at max rate when tanks had been cleaned. B. A. F.

1958. Patents. U.S.P. 2,671,035 (16.11.48; 2.3.54). W. E. Bergman, assr to Phillips Petroleum Co. Scale deposits are removed from equipment by contacting with an aq slurry of an ion exchange material.

U.S.P. 2,671,736 (11.10.50; 9.3.54). A. J. Zoeller. Ferrous metals are protected from corrosion by preheating to 600°–1000° F, immersing in molten petrolatum for 4–7 sec, and painting the metal without removing the petrolatum.

U.S.P. 2,671,757 (31.3.51; 9.3.54). T. G. Wisherd, assr to Sinclair Oil and Gas Co. Corrosion of metal surfaces by well fluids is reduced by injecting ammonia neutralized sulphonated bottoms produced in the manufacture of dodecylbenzene.

U.S.P. 2,673,817 (1.8.47; 30.3.54). A. E. Burns, assr to Hart and Burns Inc. Tanks are protected from corrosion by applying a coating composed of an aq soln of alkali silicate and finely dividing zinc and treating the coating with a saline soln having a pH of 4–8·5 to produce a complex zinc–alkali silicate *in situ*. J. M. S.

U.S.P. 2,677,618 (21.10.50; 4.5.54). E. A. Dieman and A. W. Lindert, assrs to Standard Oil Co. A rust-preventive composition consisting essentially of from *ca* 5 to *ca* 30% of a preferentially oil-soluble alkali metal sulphonate or a preferentially oil-soluble alkaline earth sulphonate or mixtures thereof, from *ca* 1% to *ca* 10% of a morpholine soap of an aliphatic mono-basic acid of at least *ca* 12 carbon atoms, and from *ca* 5 to *ca* 80% of a normally liq hydrocarbon. D. A. R.

ENGINES AND AUTOMOTIVE EQUIPMENT

1959. Preventive maintenance from breakdown experience. H. D. Adam. *Diesel Engine Users Assoc.*, Publ. S236, July 1954.—Dealing mainly with mechanical breakdowns in diesel engines, the importance of clean fuel and its achievement are stressed. A clean supply of cool lub oil is vital and methods of cooling are discussed. Proper lubrication of all parts before starting an engine is necessary. G. S.

SAFETY PRECAUTIONS

1960. Influence of temperature on the explosion risk and its significance for explosion precautions for storage tanks of inflammable liquids. R. Radusch. *Erdöl u. Kohle*, 1954, **7**, 511–13.—Explosion limits can be defined by temp, since vap concn depends thereupon; closed flash is lower explosive limit. Tank location influences explosion risk, *e.g.* gasoline has explosive limit −40° to −23° C, and hence gasoline tanks are not explosion risk outside Arctic regions. Insert gas (CO_2, N_2) can suitably be used for protection. Explosive conditions especially discussed with regard to C_6H_6 and EtOH (respective upper explosion limits 15° and 45° C) in view of explosion of tank of latter at Institute, West Virginia, U.S.A., in 1951. V. B.

MISCELLANEOUS

1961. Petroleum and national economy. Anon. *Chim. et Industr.*, 1954, **72**, 312–16.—French petroleum supplies drawn 93% from Middle East, 3·5% from indigenous sources. Half petroleum requirements have to be paid in foreign currency, equivalent to 70×10^9 fr (coal 93×10^9 fr). 13 French refineries process 22 million tons/year, scheduled for 30 million tons in 1957. Gasoline consumption in France (102 litres/head) up 32% since 1938, tax now represents 68% of price; total petroleum taxes yield 200×10^9 fr annually. V. B.

1962. Oil investment soon to reach $47 billion. Anon. *Petrol. Refin.*, 1954, **33** (8), 108.—At the end of 1954 the U.S. petroleum industry will have a gross investment of over $47 billion, 3 times as much as at the end of the second world war. Of the $4 billion capital expenditure in 1954, 55% will be for production department facilities and 21% for refineries. R. D. S.

ADDITIONS TO THE LIBRARY

ICI Engineering Codes and Regulations. Group B. Vol. 1.1. Design, Layout, and Installation of Machines. London: Imperial Chemical Industries Ltd., 1954. Pp. 96. (Obtainable from Royal Society for the Prevention of Accidents, Industrial Safety Division, 38 Millbank, London S.W.1.)

This code, the first volume in Group B, Mechanical Engineering, of the ICI Codes, sets out principles of safety precautions which should be applied to existing machinery whenever possible and incorporated in the design of all new construction.

References to Scientific Literature on Fire. Part VI. 1952. Miss E. M. Shakesshaft, Miss B. F. W. Baxter, and Miss I. G. Wolanska. Boreham Wood, Herts: Joint Fire Research Organisation, 1954. Pp. 65.

References are given to 651 items or patents relating to fire and its prevention. The bibliography refers chiefly to 1952, with some earlier references not included in previous bibliographies. A comprehensive index is provided.

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Catalysis. Vol. I. Fundamental Principles (Pt. I). Edited by Paul H. Emmett. New York: Reinhold Publishing Corpn. Pp. vi + 394.

Lubrication of Industrial and Marine Machinery. 2nd Edn. William Gordon Forbes. New York: John Wiley and Sons. London: Chapman and Hall. Pp. viii + 351.